

Assistance to Researchers in Achieving High-quality Broader Impacts



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This chapter begins with a Network-level overview of COSEE's commitment to engaging ocean scientists and facilitating the sharing of the fruits of their research with a broader audience. The overview links to a summary of the results of a Best Practices Work Session on this priority. It is followed by summaries of the broader impacts programs of each of the COSEE Centers.

Broader Impact: A COSEE National Network Perspective

Building bridges between ocean sciences research and non-scientist audiences is at the core of COSEE's mission. By engaging ocean scientists in a diversity of broader impact activities, the results and processes of ocean sciences research are being widely disseminated across the country. Until the formation of the National COSEE Network (NCN), broader impact activities by individual ocean scientists were for the most part separate from the education activities conducted by ocean science education professionals. The NCN now provides a vehicle for a nationally coordinated effort to which ocean scientists may connect for meeting their broader impact needs. By linking ocean scientists with ocean science education professionals, their combined audiences benefit from participating in activities that are grounded in the learning sciences and that contain the most current state of ocean sciences knowledge.

Center broader impact programs are diverse and offer an opportunity for determining which models are most effective for engaging the scientists as well as the participants. Scientists give presentations (both in person and over the Internet), teach courses, serve as instructors in educator professional development programs, provide research experiences for teachers, students, and the public, collaborate with educators on the development of education materials, and lead field exercises for teachers, students, and the public. The scientists have opportunities to learn about, reflect on, and reconsider approaches for addressing broader impacts as part of their funded research. They are given training in communicating their research and addressing public audiences. Center results show that scientists participating in COSEE activities improve their skills in reaching out to the media, decision makers, K-16 populations, and the general public. In addition, gains are beginning to be made in helping scientists reach out more effectively to broaden participation of underrepresented populations within the ocean sciences.

Although there are many opportunities for scientists to share their knowledge through lectures and seminars across a variety of Network activities, COSEE strives to provide more meaningful types of engagements for the scientists and their audience. Over 70% of the Centers engage between 3-6 scientists during multi-day, residential, face-to-face programs with the average number of contact hours with the audience per program being between 6-12 hours per scientist. Close to 68% of these multi-day programs engage the participating scientists for 20 or more hours with the audience. There are additional hours spent in preparation time and follow up activities. This represents a significant commitment by the participating scientists. Another of the key components of COSEE's programs is the ratio of scientists to participants on average (3-6 scientists for 16-20 participants).

COSEE has developed a new paradigm for effective scientist engagement in education and outreach in which the scientist is a more active participant in planning and implementing the activity or program and in which he/she spends more quality time engaged with the participants. In engaging scientists in broader impact activities, COSEE works with the scientists to move them up the “Ladder of Engagement”, from making a one-time presentation to engaging with audiences over an extended period of time.

It is important to understand the scientists’ motivations for engaging in education and outreach (E & O) activities so that their needs get met. Centers have identified scientists’ needs to learn how to teach, craft sound broader impact plans for their proposals, increase their capacity to communicate, give to their communities, support graduate students, train their graduate students to teach, develop strategies for citizen science programming, and reach a more diverse audience in recruiting students for ocean sciences careers. COSEE is addressing these needs throughout the country as well as helping ocean scientists move beyond their individual motivations and understand that they are needed by the public and why.

It is important for the scientists to come away from their participation in broader impact activities having professionally benefited themselves. The effective programs identified by the NCN provide scientists with training on effective and interactive instructional methods and tools that they can use in the future; exposure to new curriculum materials that they can use with their own students; introduction to new assessment strategies; and training on delivering effective ocean sciences content through on-line tools such as webinars and blogs.

Post-program activities help the participating scientists to stay connected to their colleagues, participants, and the broader COSEE learning community. Scientists mentor participants; visit classrooms and informal science education institutions; engage in online or virtual collaborations; and provide their presentations and other content resources as educational tools. The Centers also provide various types of post-program support to scientists, including financial support to present at national and regional conferences, co-authorship of educational journal articles, and community engagement in on-line social networking environments.

There are benefits to the scientists to remain members of the COSEE community. Through social networking sites, they can communicate with like-minded colleagues and share their education and outreach experiences. By joining Center list-servs and blogs and receiving Center and Network newsletters, they can stay updated on ocean sciences education initiatives, new tools, and opportunities for further broader impact activities.

Center evaluations of the impacts on their ocean scientist participants have shown that the scientists have gained a greater appreciation for the manner in which pre-college students and the public needs to have research relevance based on the concept of *"so why should I be interested in these findings and what do they do for me?"* in addition to learning the underlying scientific concepts. They also gain awareness of *"what teachers do"* on a daily bases, and they are more knowledgeable about the importance of standards and testing and the need to ground instruction in *"brain friendly"* strategies.

As with all COSEE activities, the engagement of ocean scientists in broader impact activities is based on the most effective practices that can be gleaned from the literature and determined from

Center evaluation results. Effective practices as determined by COSEE and incorporated into Network broader impact activities include the provision of professional development in communicating science for the scientists and participating graduate students. The COSEE California (CA) Communicating Ocean Sciences Course is an example of a successful scientist engagement model that exposes the scientists and graduate students to learning theory as it applies to science communication. A key ingredient of this model is that the scientists who are part of the course also plan the content that they will deliver. Many COSEE Centers and over 25 other institutions have adopted this course across the country. COSEE Networked Ocean World (NOW) has adapted the course to reach 4H audiences. The COSEE CA team, in partnership with COSEE West and COSEE Pacific Partnerships (PP), has adapted the full 16–week course to train the 2011 national cadre of Knauss Fellows.

Another effective practice is the development of communities of practice for scientists and graduate students working with and serving as communicators. One highly effective model has been developed by COSEE Ocean Systems (OS). Through their on–line Climate/Ocean Interactive Concept Mapping tool and workshop for scientists and educators, communities of practice have been and continue to be formed throughout the Network and beyond. This model is currently being expanded to include training for the scientists on how to blog effectively. Also both the scientists and educators are trained to use software that involves building interactive concept maps. These educational tools can then be accessed on–line by scientists and educators and adapted for their own use.

Most COSEE broader impact activities include opportunities for mentoring. COSEE staff mentor scientists that become engaged in COSEE activities. The scientists are provided guidance about the attributes of the audience they will face, including what the audience’s needs might be. This guidance is not very effective if it is a “*one shot*” approach. COSEE Central Gulf of Mexico engages their participating scientists one–on–one and over multiple encounters. Although this is time consuming, it is paying off, as their evaluation results show that the scientists are staying longer at the events than required. These scientists are also involved in content development and help the Center staff to formulate good test and measurement strategies. True mentoring comes from interactions over time.

In September 2010, the National COSEE Office facilitated a two–day work session on effective practices in engaging ocean scientists in broader impact activities. A summary of this work session and the results of a survey administered to the Centers to gather data on their programs can be found at [Best Practices in the Engagement of Ocean Scientists.pdf](#). (See appendices)

COSEE Scientist Survey

In 2010 the COSEE Center evaluators identified 749 ocean scientists that had worked with COSEE during 2009. This survey was refined and administered again in early 2011 for scientists who participated in COSEE activities during 2010. These data are assisting COSEE in identifying the most effective means of reaching ocean scientists. A discussion of the survey results can be found in the Scientist Engagement Survey section of the Evaluation chapter of this report.

Broader Impacts: Programs of the COSEE Centers

COSEE California

COSEE CA has long specialized in providing researchers with opportunities to participate in education and outreach activities as a way to fulfill the broader impact component of their research proposals. In the first 5 years, these efforts focused on forging partnerships between researchers and educators from a wide variety of informal science education institutions (local, regional and national), in providing support for researchers interested in using the Communicating Ocean Sciences course as their broader impact activity, and in engaging researchers in the COSEE CA Marine Activities Resources and Education (MARE) program. These activities all continue at various levels in the second generation COSEE CA, and have been expanded through a newly forged collaboration with the San Diego Unified School District that provides a new suite of education and outreach opportunities for researchers in K–14 formal education. COSEE CA provides researchers with access to E&O “infrastructure”, that is existing education programs and projects, and tailors each researcher’s proposed activities to fit the needs of their education partners. As personal relationships now exist between COSEE CA personnel and a wide variety of education and outreach professionals, the “match–making” between research scientists and educators is greatly facilitated and COSEE CA is able to provide researchers with efficient ways to participate in education and outreach activities that simultaneously fulfill specific needs within the formal and informal K–14 community.

A complete listing of broader impact assistance offered over the last 8 years is beyond the scope of this document. In summary, COSEE CA has assisted on more than 175 broader impact components for proposals to the NSF, NOAA and CA SeaGrant, benefitting many hundreds of scientists. Examples of broader impact activities facilitated include: 1) giving a public presentation that is broadcast via cable TV (>15 million households served) and streamed on the internet by UCSD–TV (> 80K views is typical for a given talk); 2) providing teacher professional development to science teachers in San Diego Unified School District, the 2nd largest district in CA and the 8th largest urban district in the nation; 3) providing Research Experiences for Teachers; 4) serving as content consultants for science center exhibit and program design; 5) facilitating lab to classroom videoconferencing; and 6) providing mentoring for underrepresented students through local non–profit science education organizations, to name a few.

In addition to broader impact assistance, COSEE CA has crafted education and outreach programs for (proposed) large research initiatives, has created programs that allow scientists to have *broader impact*, and has offered courses that better prepares researchers for future participation in education and outreach activities. These activities are summarized below.

Broader Impact for Large Research Initiatives or Long–term, Lab–wide Collaborations

COSEE CA has often been called on to provide guidance for how broader impact can be handled for large, relatively long–term project proposals (e.g. Long Term Ecological Research; Science and Technology Centers; Ocean Observing Systems). Below are brief descriptions of some of the large broader impact components that COSEE CA has facilitated.

Long Term Ecological Research (LTER): Mark Ohman

The NSF-funded California Current Long Term Ecological Research Site (CCE LTER) is one of only a few marine-focused LTERs. COSEE CA worked closely with the project PI to develop a multi-faceted education and outreach plan that included funding for a part time E&O coordinator, incorporation of student and teacher participation in coastal ocean time series data collection, and a teacher at sea program. The collaboration started in 2006 and continues today.

RIDGE 2000 Office: Chair Donna Blackmon

COSEE CA worked with the RIDGE2000 Chair Donna Blackmon to craft the E&O portion of the proposal to locate the R2K office at SIO. The plan included hiring a part-time E&O coordinator, developing K-12 lesson plans designed to involve teachers and their students in experiments on seagoing voyages, developing a Mid-Ocean Ridge exhibit element for display at the Birch Aquarium, and hosting the national high school student ROV competition at UCSD.

Science and Technology Center: Mark Hildebrand

COSEE CA worked with the project PIs to forge education and outreach partnerships with several regional informal science education institutions. The plan also included funding for a part-time E&O coordinator.

Ocean Observatories Initiative (OOI): John Orcutt

The NSF Funded Ocean Observatories Initiative (OOI) is a Major Research Equipment and Facilities Construction program with a total budget of close to \$400M. COSEE CA was the lead in writing the education component of the Cyberinfrastructure Implementing Organization (CI IO) proposal and a partner in crafting the education plan for the Coastal/Global Scale Nodes Implementing Organization proposal. COSEE CA remains active in the OOI Education and Public Engagement team (representing the CI IO).

Southern California Coastal Ocean Observing System (SCCOOS): John Orcutt

COSEE CA facilitated a key partnership for the first implementation of the NOAA funded Southern California Coastal Ocean Observing System (SCCOOS). Through COSEE CA, SCCOOS PIs and Project Director were introduced to the Director of Education at the Ocean Institute in Dana Point. Among several outcomes of this partnership were a 5th grade science curriculum, Weather and Water, which included a component that uses near real-time observatory data. COSEE CA continues to participate in the Southern California Coastal Ocean Observing System educational activities.

Joint Institute for Marine Observations (JIMO): Ken Melville

JIMO is a NOAA funded Cooperative Institute through the OAR branch office at NOAA. The JIMO program has called on COSEE CA to provide assistance to its researchers in education and

outreach activities. In the recent (unsuccessful) resubmission for continued funding , COSEE CA crafted the education component for the proposed program, including a UCSD–TV public speaker series that would reach millions through broadcast and web downloads and a major interactive exhibit that would allow visitors access to real–time observatory data.

The Digital Fish Library (DFL): Philip Hastings

The Digital Fish Library (<http://www.digitalfishlibrary.org>), is a digital collection that includes MRI images of the SIO Marine Vertebrate Collection as well as information related to the species' taxonomy, biology, ecology, and conservation efforts. COSEE CA was the lead on the education component for this large project and created a companion educational website, including interactive animations and visualizations, for this science digital library project.

Marine Natural Products Lab Long term Broader Impact: William Gerwick

COSEE CA has long sought to make education and outreach partnerships and activities sustainable beyond COSEE CA facilitation. A model for achieving sustainability has been created by partnering a large research lab at Scripps with three 7th grade life science teachers at Pershing Middle School in the San Diego Unified School District. Three generations of Gerwick graduate students have now participated in the interactive virtual lab tour that was born out of broader impact component facilitated by COSEE CA. The project, which reaches about 300 Pershing students per year and is fully integrated into the teachers' clinical trails unit of study, is now stand–alone and proceeding without assistance from COSEE CA.

NOAA Environmental Cooperative Science Center: Benny Ron

Benny Ron is the Aquaculture Program Coordinator, Office of Vice Chancellor for Research and Graduate Education, University of Hawaii–Manoa. POLYPPS (a COSEE CA partner), staff provided assistance with crafting the undergraduate education and curriculum elements of a NOAA Environmental Cooperative Science Center proposal focused on Integrated Adaptation Management. J. Lemus will serve as an advisor for the education plan. The proposal is still under consideration for funding.

NSF Climate Change Education Partnership: Charles Fletcher

POLLYPS PIs Lemus and Duncan collaborated with Chip Fletcher Professor, UH–Manoa on an NSF Climate Change Education Partnership proposal to build a climate science network and increase climate science knowledge in Hawaii and other Pacific Islands. This effort was not funded, but Drs. Fletcher and Lemus have been approached by another Hawaii–based CCEP funded project to build collaborations with UH climate scientists and educators.

University of Hawaii–Manoa, NSF Science and Technology Center: James Cowen

Dr. James Cowen, Research Scientist, UH–Manoa, requested assistance from POLYPS for education and outreach activities under the Center for Dark Energy Biosphere Investigations NSF STC program. POLYPPS provided several mechanisms for researcher participation in ongoing activities.

Other Activities that Enable Researcher Participation in High Quality Broader Impact activities

Dr. Gary Griggs, Director of Long Marine Laboratory, UC Santa Cruz and Chair of the University of California Marine Council

An example of COSEE California helping a scientist to strategically contribute to K–12 curriculum development is the relationship we have established between Dr. Gary Griggs (Director of Long Marine Laboratory, UC Santa Cruz and Chair of the University of California Marine Council) and the NSF–funded Seeds of Science/Roots of Reading program curriculum development project at Lawrence Hall of Science. Dr. Griggs has played three critical roles in the project: 1) at the outset of the development of an extensive unit on Shoreline Science, he identified important concepts to be addressed by the materials; 2) he serves as science content reviewer and advisor for all materials in the Shoreline Science unit; and 3) he served as a scientist role model that is profiled in a biographical student reader that accompanies the unit. The reader will be used both to teach reading/language arts and to reinforce science concepts introduced in hands–on activities. In all three cases, his relatively brief involvement has been instrumental in shaping the outcome of this complex effort.

Steinbeck Scholars

An example of COSEE California helping a research expedition to communicate in real time with classrooms nationwide is our work with Back to the Sea of Cortez: Sailing with the Spirits of John Steinbeck and Ed Ricketts. A team of scientists and Steinbeck scholars embarked on March 11, 2004, on a 74–foot fishing boat to retrace the historic expedition that John Steinbeck and Edward F. “Doc” Ricketts made to explore the Sea of Cortez in 1940. Jon Christensen, a science writer and Steinbeck Fellow, traveled with the expedition and posted daily logs of the journey online. Students and teachers in Baja California were invited to join the expedition to study life in the tide pools with the team. CA COSEE was instrumental in getting information out to a national K-12 education audience, inviting them to communicate with the crew by email, and to explore the connections between science, literature, history, the environment, conservation, and our oceans. To see the website check www.seaofcortez.org and www.mardecortez.org.

Communicating Ocean Sciences Workshops for Scientists

COSEE California, with funding from both NSF OCE and NSF ISE, has developed three versions (half–day, whole–day, two–day) of a workshop for scientists focused on improving their capacity to develop and implement more effective Broader Impact activities. The workshops,

based on the successful Communicating Ocean Sciences (COS) college courses, have been co-developed by COSEE California and several partners from throughout the COS Network, including COSEE NOW, COSEE Pacific Partnerships and COSEE West. The workshops have been pilot tested in 2010 and will be finalized and disseminated in 2011.

University of Hawaii

During March 2009, we presented Communicating Ocean Sciences workshops at the University of Hawaii as part of the efforts of COSEE CA New Collaborators, and in Mississippi for COSEE-CGOM. These workshops allowed us to disseminate the courses to many different and varied institutions, provide concrete opportunities for scientists and educators to work together around a common project, provide scientists with effective means for broader impact, and share effective learning and teaching pedagogy and practices as exemplified in the course materials and trainings. As a result of the workshop, at least 5 institutions plan to offer/co-offer COS including University of Hawaii (Hilo and Manoa campuses), Waikiki Aquarium, Hawaii Pacific University, and Maui Community College. Other participating organizations plan to collaborate with one of the universities/colleges offering the course, or use the course materials to train their staff/volunteers that work with the public.

Stevens Institute of Technology and Engineering

Stevens Institute of Technology has an NSF GK-12 grant, “New Jersey Alliance for Engineering Education (NJAE)””, which is using the Communicating Ocean Sciences course as a model to create a new “Communicating Engineering” course to train their Engineering Fellows. COS staff from LHS offered a modified Communicating Ocean Sciences workshop for the PI’s, faculty, mentor teachers and Fellows at the Stevens Institute to help provide them with the learning theory and teaching practices to more effectively communicate their subject matter and enhance STEM learning for their audiences of nearly 12,000 high school students, and 130 K-12 teachers. This new course will also aid in providing professional development and a graduate certificate in education for the GK-12 Fellows and could be of tremendous value to other engineering programs nationwide.

University of California, Berkeley Engineering Department

Faculty from the Engineering Dept, (fluid dynamics) at UC Berkeley, have shown interest in the course and attended some of our June 2009 Instructor’s Workshop to find out more about the program. In Year 2, a faculty member included broader impact efforts into an Early Career grant proposals to collaborate with educators at the Lawrence Hall of Science around our various ocean sciences efforts, including Communicating Ocean Sciences. The Early Career proposal was not funded, but the reviewers said that the broader impact portion of the proposal was very strong. As a result, he resubmitted the proposal this year.

University of Hawaii-Manoa IGERT Program

Dr. Roger Lukas requested assistance from POLYPPS to provide Communicating Ocean Science training to graduate students in conjunction with an IGERT proposal.

Hawai‘inuiakea School of Hawaiian Knowledge, UH–Manoa, Maenette Benham, Dean

POLYPPS was invited to participate as an advisor on an NSF ISE Pathways proposal to develop a culturally relevant place-based watershed STEM education program. POLYPPS also committed to provide the project with mechanisms to connect with other science educators and community groups working toward similar STEM education goals. The proposal is still under consideration for funding.

FLIP Video Cameras For Use By Research Scientists In The Field

Our scientists will take the cameras into the field with them, video their activities, and email the videos to UH–Manoa. The videos will be edited and posted to the POLYPPS web site.

COSEE West

Assisted In SMBO Education Outreach Program

Dr. Nicolas Gruber at the Institute of Geophysics and Planetary Physics at UCLA received NSF funding for the Santa Monica Bay Observatory (SMBO, part of the larger Southern California SCCOOS network) from 2005–2008 with middle and high school teachers who participated in COSEE–West to develop an educational web portal for UCLA’s mooring to make the data collected available in the classroom. Teachers participated with their students in some of his research cruises. Teachers contributed lesson plans to the SMBO education portal. Renee Klein and her students at Animo Venice Charter High School used GIS to collect data at the Ballona Wetlands and the Santa Monica Bay mooring on water monitoring, pollution tracking and biological data (salinity, dissolved oxygen, turbidity, temperature, conductivity, TD's, chlorophyll/density, nitrates/nitrites at different depths). Her students also created a PowerPoint presentation and conducted education outreach at five schools to encourage other students to learn more about ocean sciences. Bob Perry and his students at Malibu High School used the Santa Monica Bay mooring data to examine vertical temperature structure (collecting air temperature, wind speed and direction, conductivity, pressure) as an offshoot from their ongoing data collection for the OceanGLOBE program. Bob Perry developed the OceanGLOBE program based on the existing GLOBE protocol, with support from NSF Teacher Enhancement Programs LIMS and SSWIMS through UCLA.

Assisted In Pacific Oyster Education Outreach Program

Dr. Dennis Hedgecock at USC conducted an education outreach program as part of the College Mentors program in which personal connections to K–12 students facilitated the likelihood that they would see college as a logical career choice. Two other principal investigators from the east coast scheduled visits to Los Angeles to participate in the curriculum development and lecture process each year, and to ensure that the graduate students funded by this grant participated in the lecture process and in the College Mentors program. The project directly trained postdoctoral researchers and graduate students on the campuses of the PIs.

Wrote Letters of Support for Scientists’ Education Outreach Programs

COSEE–West wrote letters of support as part of a RFP from NSF for five regional COSEE Centers: TUSCOSEE, COSEE–OESS, COSEE–OHH, COSEE Colorado, and the Urban See COSEE. COSEE–West staff collaborated and wrote letters of support on three separate NSF GEOTEACH proposals. COSEE–West wrote a letter of support for Dr. Gail Scowcroft of the University of Rhode Island to be the National Central Coordination Office. COSEE–West wrote letters of support for educational projects at the Santa Monica Pier Aquarium, STAR ECO Station; Tara Chavlaski (Iridesence); and Los Angeles Maritime Institute’s TopSail program. COSEE–West supported three collaborative proposals as part of a NSF RFP: 1) Dr. David Hyrenbach, Hawaii Pacific University, 2) Dr. Lesley Smith, University of Colorado in collaboration with COSEE–West (received funding), 3) Dr. Laura Murray, University of Maryland Horn Point Laboratory for COSEE Coastal Trends. COSEE–West partnered on three

NSF proposals for the COSEE call for proposals for funding from the stimulus package, all of which received funding. COSEE–West wrote letters of support for COSEE–West teacher Scott Sperber to participate in several teacher research opportunities including School of Rock Deep Earth Academy on ocean drilling, NOAA Pacific Islands Fisheries Science Center on their Coral Reef Ecosystem Integrated Observing System, Teacher at Sea, and the ARMADA Project. COSEE–West wrote a letter of support for Dr. Dale Keifer (USC) and DG Webster (Dartmouth) for a Fishscape fisheries grant. COSEE–West wrote letters of support for three collaborative proposals for the NSF Climate Change Education Partnership (CCEP) Phase I proposals. COSEE–West wrote a letter of support for Dr. Anita Leinweber and Dr. Rebecca Shipe, both from University of California Los Angeles, for an NSF grant. COSEE–West wrote a letter of support for Patricia Halpin of UCLA, Spatial Realism in the Mussel Bed Disturbance Paradigm, for an NSF grant. COSEE–West wrote a letter of support for Cabrillo Marine Aquarium, for a grant to the Resources Legacy Fund Foundation for implementing strategies to increase public literacy about marine protected areas. COSEE–West wrote a letter of support for Dr. Katrina Edwards of University of Southern California for an NSF grant for her education outreach program associated with her instrumentation grant. COSEE–West wrote a letter of support for Kimberly Merritt–Spencer, teacher at Lawndale High School, for a proposal for a California Partnership Academy at her school to establish a marine science magnet, which was recently funded. COSEE–West wrote a letter of support for Carrie Wolfe at Southern California Marine Institute for educational program funding. COSEE–West wrote a letter of support for Anne Marie Wotkyns of Monlux Math Science Technology Elementary School (LAUSD) for the Albert Einstein Distinguished Educator Fellowship Program. COSEE–West wrote a letter of support for Mark Friedman of Animo Charter Leadership High School (Green Dot/Lennox USD) for the Richard C. Bartlett Environmental Education Award. COSEE–West wrote two letters of support for Dr. Jeff Hare of the University of Colorado Boulder for two NOAA proposals.

Assisted in Developing Scientists’ Broader Impacts Programs

COSEE–West staff worked with several faculty members at UCLA (Dr. Anita Leinweber, Dr. Rebecca Shipe, Dr. Heather Tarleton, Dr. Aradhna Tripathi) and USC (Dr. Douglas Capone, Dr. Andrew Gracey, Dr. Will Berelson, Dr. Dave Caron, Dr. Mark Thompson, Dr. Karla Heidelberg, Dr. John Heidelberg, Dr. Douglas Hammond, Dr. Katrina Edwards, Kathleen Ritterbush) to develop Broader Impact sections of their NSF proposals to support additional COSEE–West projects. *Dr. Webke Zeibis* and Dr. Astrid Schnetzer of USC worked with COSEE–West to develop an outreach element for a series of research cruises. COSEE–West assisted two graduate students (Danna Staaf and Julia Stewart) at Hopkins Marine Station, Stanford University, with education outreach efforts on dissecting Humboldt squid based on a kit they developed and web resources. COSEE–West recruited teachers to provide feedback on the web resources, and the graduate students were speakers at a COSEE–West squid workshop. COSEE–West helped scientists with the University of Colorado Boulder of the COSEE–West Colorado Collaborative with their education outreach program with a lecture series linked to classroom activities and field trips.

Scientists Participated in COSEE–West Activities

Dr. Suzanne Edmands of USC was a regular guest presenter/mentor of the COSEE–West lecture and workshop series. Dr. William Hamner of UCLA spoke at the Introduction to Marine Science summer teacher workshop. Dr. Anita Leinweber of UCLA, Dr. Laura Murray of University of Maryland Horn Point Laboratory for COSEE Coastal Trends, and Mr. Benjamin Holt of Jet Propulsion Laboratory spoke at the OOS summer teacher workshop. Dr. Anita Leinweber and Dr. Rebecca Shipe of UCLA implemented a NSF Criterion II project, which involved two SMBO workshops for teachers to develop lesson plans using data from SCCOOS. Dr. Burt Jones of USC, Dr. Ivona Cetinic of USC, Dr. Rebecca Shipe of UCLA, Dr. Anita Leinweber of UCLA, Dr. Ichiro Fukumori of Jet Propulsion Laboratory, participated in the OOS summer teacher workshop with COSEE–West and COSEE Coastal Trends. Dr. James Fawcett of USC, Dr. John Dorsey of Loyola Marymount University, Dr. Karen Martin of Pepperdine University, Dr. Patrick Krug of California State University Los Angeles, and Dr. Douglas Capone of USC spoke during the Introduction to Marine Science workshop. Dr. Burt Jones of USC, Mr. Will Hobbs of the Jet Propulsion Laboratory, and Ms. Autumn–Lynn Harrison, graduate student at University of California Santa Cruz, spoke in the OOS summer teacher workshop with COSEE–West and COSEE Coastal Trends. Dr. Chris Lowe (California State University Long Beach), Jane Lee (COSEE–West), and teacher Amy Hill (Chadwick High School) presented a symposium on COSEE–West: Building Bridges between Ocean Scientists, Educators, and Students at the 2010 AAAS meeting in San Diego, CA.

Facilitating Connections Between Scientists and Educators

COSEE–West participant Gillian Keller was referred to Dr. David Hyrenbach at Hawaii Pacific University, Dr. Judy Lemus (Co–PI, COSEE–West) at the University of Hawaii and to Dr. Pat Krug and Dr. Lisa Torres at California State University Los Angeles for advice on going for a Master’s degree in marine science. Dr. Chris Lowe of California State University Long Beach gave Dana Lebental of University High School information about summer volunteer opportunities for conducting shark research. Dr. John Dorsey at Loyola Marymount University volunteered to help the Marina del Rey Middle School Marine Science Academy develop research projects for its students working along with Loyola Marymount University students and a non–governmental organization (Friends of Ballona Wetlands) in the Ballona Wetlands. Tara Treiber from Santa Monica Pier Aquarium needed information to identify local marine mammal skulls and was referred to Dr. Peter Adam and Dr. Josh Samuels at UCLA. Dr. Peter Adam later gave a COSEE–West lecture on Marine Mammals at the LAUSD Center for Marine Studies at the Ft. McArthur Marine Mammal Care Center. A question from Lisa Niver of Curtiss Middle School was posted on the COSEE listserv and answered by Chris Parsons at COSEE NOW and Andrea Anderson at COSEE Ocean Learning Communities. She also received references from Ravit Golan Duncan, Assistant Professor of Science Education at Rutgers, State University of New Jersey. Dr. Carl Carrano, chair of the Department of Chemistry and Biochemistry at San Diego State University, was referred to Dr. Cheryl Peach at COSEE California at Scripps Oceanographic Institute on developing an education outreach plan as part of an upcoming NSF proposal. Janice McDonnell from COSEE NOW referred Teresa Tucker, a K–12 teacher from Michigan, to COSEE–West. She is writing her master thesis on incorporating OOS content in the classroom. As part of her thesis, she will be creating an OOS website for teachers and students,

and potentially including it on the Santa Monica Bay Observatories website. She received a travel stipend from MSELA (Michigan Science Education Leadership Association) to attend the COSEE–West OOS summer workshop. MSELA requires presentation of lesson plans. Sara Burns, one of the teachers who participated in the OOS teacher workshop spoke to Dr. Rebecca Shipe about her phytoplankton research to develop a lesson plan.

Concept Mapping Collaborative Workshops

Collaboration with COSEE Ocean Systems, COSEE California, and COSEE NOW to do a two-day workshop on climate change in which scientists and graduate students from USC, UCLA, and local California State Universities use concept mapping to explain their research.

Smithsonian Ocean Hall

The COSEE Network has partnered with the Smithsonian Museum of Natural History/Sant Ocean Hall to host an ocean sciences lecture series Changing Tides: A Series of Ocean Discussions and associated program to support ocean literacy, disseminate information on recent ocean science research and discoveries, and provide a forum for the public to discover how humans and the ocean are inextricably connected. A novel audience participation and interaction activity will begin and conclude the lectures to assess audience knowledge and awareness pre- and post-lecture. The kick-off for the lecture series was a joint NMNH/COSEE "Educator's Night" event for local teachers and school administrators that aimed to encourage their students and teachers to attend the lectures. During this event educators received educational materials from COSEE on topics related to the lecture series.

Collaboration on C–DEBI Education Outreach Program

Dr. Katrina Edwards, University of Southern California, received a \$25 million NSF grant to establish a new Science and Technology Center (STC) for the Center for Dark Energy Biosphere Investigations (C–DEBI) focused on Microbial Life in the Deep Sea Floor and Crust. Dr. Linda Duguay (COSEE–West) will participate in the Center and COSEE–West will deliver lectures and workshops and create a blog to engage multiple COSEE Centers in C–DEBI activities.

Assisting in Ocean Acidification Education Outreach Program

Dr. Rebecca Shipe and Dr. Anita Leinweber of the University of California Los Angeles received funding for looking at the effects of ocean acidification on the phytoplankton community composition and productivity in the Santa Monica Bay. COSEE–West assisted in organizing teacher workshops on having teachers use this content in their classrooms.

Field Trip with Tessaract High School

Tessaract High School in Arizona sent their sophomore class to spend two days with University of Southern California Marine and Environmental Biology scientists and staff. They spent the first day on the main campus touring labs and speaking with scientists and grad students. The second day was spent at Wrigley Institute for Environmental Studies on Catalina Island learning

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more about the research done in the field, learning about the use of gliders. Students could tell that scientists were passionate about their science yet able to share it in ways the students could understand and could envision studying science at school.

COSEE Central Gulf of Mexico

2010 Online Institutes: Because of the BP Deepwater Horizon Oil Spill on April 20, 2010–July 15, 2010 (the well was capped on July 15; on August 4–5 the well was killed), our scientists were late in their Power Point presentation preparations for the 2010 Online Institute and our teacher enrollment numbers were low. Therefore, on June 11, 2010, the PI/Co–Investigators cancelled the 2010 Online Institute that was originally scheduled for July 5–30. However, the PowerPoints listed below are on the COSEE CGOM website.

Dr. Jessica Kastler, USM–GCRL–MEC, The Gulf of Mexico: Understanding America’s Sea

Outcomes: Dr. Kastler is a Co–PI of COSEE CGOM and served as Keynote presenter for the online presentations in 2006, 2007, 2008, 2009, and 2010. Dr. Kastler also served as a presenter for the face–to–face component of the Summer Institute in LA in 2005 and 2006.

Dr. Ernest Estevez, Mote Marine Lab, Climate Change and Sea Level Rise Along the Gulf of Mexico

Dr. John Dindo, DISL, Fisheries Management and the Role of APEX Predators

Outcomes: Dr. Dindo is a Co–PI of COSEE CGOM and served as Keynote presenter for the online presentations in 2005, 2008, 2009, and 2010 and a presenter in the face–to–face component of the AL Summer Institute in 2007.

Dr. John Lehrter, University of Alabama, Water Quality in the Gulf of Mexico: A Focus on Nutrient Enrichment and Eutrophication Impacts

Dr. Jay Grimes, USM–GCRL, Oceans and Human Health: A New Concept, A New Federal Program, A New Research Direction

Dr. Mike Spranger, UF–Florida Sea Grant Extension, Environmental Stewardship in the Gulf of Mexico

Outcomes: Dr. Spranger is a Co–PI of COSEE CGOM and served as Keynote presenter for the online presentations in 2003, 2005, 2008, 2009, and 2010.

2009 Face–To–Face Institutes (Scientists And Affiliations)

AL: Dauphin Island Sea Lab, June 21–26, Dauphin Island, AL

(Note: Thirteen—teachers [two female preservice and 11 inservice] with 10 females and three males; six scientists, two females and four males with one being Asian, and five Caucasian.)

2011 COSEE Decadal Review

Dr. Marcus Drymon, DISL, Fisheries.

Outcomes: Dr. Marcus Drymon was involved as a scientist in COSEE CGOM events: face-to-face component of the 2008 and 2009 Summer Institutes in AL and the 2008 Two-Day Workshop in AL.

Dr. Tami Wells, University of South Alabama, Marsh Vegetation and GIS.

Outcomes: Dr. Tami Wells participated in the following COSEE CGOM events: 2004 and 2008 Two-Day Workshops; in 2004, 2005, and 2006 she served as a scientist in the face-to-face component of the MS Summer Institute; and in 2009 Dr. Wells was a scientist in the face-to-face component of the AL Summer Institute. Dr. Wells participated in the 2005 Joint MS-AL Two-Day Workshop.

Dr. Andy Coleman, University of Alabama at Birmingham, Diamond Back Terrapins.

Dr. Jonathan Huang, University of Alabama at Birmingham, Shellfish Safety/Ocean and Human Health.

Dr. Tina Miller-Way, Marine Scientist-Educator, Northern Gulf Institute Liaison, DISL.

Dr. Ryan Moody, DISL, Evolutionary and Ecological Development of Predator-Prey Interactions and Impacts on Benthic Marine Systems and Trophic Dynamics and Community Succession Within Created and Restored Salt Marsh Habitats.

LA: USDA Natural Resources Conservation Service—Plant Materials Center, June 21–26, Galliano, LA

(Note: Nine teachers—three preservice, six inservice, all females with seven being Caucasian and two African American; six scientists, two females and four males, five Caucasian, one Asian-Indian)

Mr. Andrew Barron, Barataria-Terrebonne National Estuary Program, LA, Water Quality Coordinator.

Outcomes: Mr. Andrew Barron was a presenter at the Two-Day Workshop in LA in 2004, as well as a face-to-face scientist during the 2003 and 2009 LA Summer Institute. Mr. Barron also served as an online presenter in 2007.

Dr. Eurico D'Sa, Louisiana State University, Coastal Studies Institute, Coastal Satellite Remote Sensing and Physical-Biological Interactions.

Ms. Kelly Folkedahl, Moorpark College, CA, 2009 graduate, Marine Mammals.

Dr. Mark Konikoff, University of LA, Lafayette, Associate Professor, Department of Biological Sciences, Fisheries Biology.

Outcomes: Dr. Mark Konikoff participated in the following COSEE CGOM events: he served as a scientist in the face-to-face Summer Institutes for 2007, 2008, and 2009. It should be noted Dr. Mark Konikoff requested in 2007 to be a face-to-face presenter for 2008 and 2009.

Dr. Richard Neill, USDA Natural Resources Conservation Service—Plant Materials Center, Plant Restoration in Louisiana Wetlands.

Ms. Allison Walker, University of Southern Mississippi, Doctoral Student, Fungal Ecology/Coastal Restoration.

2009 Online Institute (Scientists and Affiliations):

Note: All presentations are aligned to one (or two) of the Gulf of Mexico Alliance's Priority Issues (Six scientists, one female and five males, all Caucasians)

Dr. Jessica Kastler, Research Associate, USM, Department of Coastal Sciences, Research Associate, Presentation: Gulf of Mexico: Understanding America's Sea.

Outcomes: Dr. Kastler is a Co-PI of COSEE CGOM and served as Keynote presenter for the online presentations in 2006, 2007, 2008, 2009, and 2010. Dr. Kastler also served as a presenter for the face-to-face component of the Summer Institute in LA in 2005 and 2006.

Mr. Joe Swaykos, Director, Center of Higher Learning, Stennis Space Center, Presentation: Improved Coastal Resiliency Through the Use of Storm Surge Visualization.

Dr. Ken Heck, Chief Marine Scientist, Dauphin Island Sea Lab, Presentation: Oyster Reef and Estuarine Landscape Restoration.

Outcomes: Dr. Ken Heck served as a scientist for the face-to-face component of the Summer Institute in AL in 2005 and as a Keynote presenter in the online component of the Summer Institute in 2009.

Dr. Mike Carron, Chief Scientist, Northern Gulf Institute, Presentation: Assessing the Health of a Marine Ecosystem: A case study in the Gulf of Mexico.

Outcomes: Dr. Mike Carron served as a Keynote online presenter in 2008 and 2009.

Mr. Andrew Barron, Water Quality Coordinator, Barataria-Terrebonne National Estuary Program, Presentation: Water Quality Issues Around the Gulf of Mexico.

Outcomes: Mr. Andrew Barron was a presenter at the Two-Day Workshop in LA in 2004, as well as a face-to-face scientist during the 2003 and 2009 LA Summer Institute. Mr. Barron also served as an online presenter in 2007.

Dr. Mike Spranger, Associate Director for Extension and Education, University of Florida Sea Grant, Gainesville, FL, Presentation-Stewardship: Making a Difference in the Gulf of Mexico.

Outcomes: Dr. Spranger is a Co-PI of COSEE CGOM and served as Keynote presenter for the online presentations in 2003, 2005, 2008, 2009, and 2010.

2009 Two-Day Workshops (Scientists and Affiliations)

MS: November 13–15, 2009, Camp Timpoochee, FL

Mr. Bruce Leybourne, Climate Change, Geostream Consulting.

Outcomes: Mr. Bruce Leybourne served as a scientist in the Two-Day Workshop in MS in 2003 and 2009 and in the 2005 face-to-face component of the MS Summer Institute.

Dr. Crystal Johnson, Oceans and Human Health, USM-GCRL-Senior Research Scientist, Dept. of Coastal Sciences.

Outcomes: Dr. Crystal Johnson served as a scientist in the Two-Day Workshop in 2007 and 2009 in MS, and in the face-to-face component of the MS Summer Institute in 2006. Dr. Johnson is also serving as the COSEE CGOM case study.

Dr. Tom Lytle (retired), Oceans and Human Health, USM-GCRL, Dept. of Coastal Sciences.

Dr. Julia Lytle (retired), Oceans and Human Health USM-GCRL, Dept. of Coastal Sciences.

Outcomes: Dr. Judy Lytle served as a scientist in the 2007 and 2009 Two-Day Workshop in MS.

FL: September 11–13, 2009, Port St. Lucie, FL

Dr. Richard Tankersley, Florida Institute of Technology, Professor, Area of Expertise: Marine Invertebrates (horseshoe crab)/Biological Oceanography.

Outcomes: Dr. Richard Tankersley served as a scientist for the Two-Day Workshop in FL in 2009 and the face-to-face component of the FL Summer Institute in 2008.

2008 Face-to-Face Summer Institutes (Scientists and Affiliations):

FL Institute: June 22–27, Cedar Key, FL (13 teachers—eight females and five males with 11 being Caucasian and two being Hispanic; six scientists—two females and four males with five being Caucasian and one being Hispanic).

Mr. Don Behringer, University of Florida, Fisheries Scientist, Area of Expertise: Lobster Biology/Fisheries Management.

Outcomes: Mr. Don Behringer served as a scientist in the face-to-face component of the FL Summer Institute in 2004, 2005, and 2008; he served as a scientist in the Two-Day Workshop in FL in 2006. Dr. Behringer is also a member of the COSEE CGOM Advisory Team.

Dr. Tamara Frank, Harbor Branch Oceanographic Institute, Education and Outreach Coordinator, Gulf of Mexico Ocean Observing System, Area of Expertise: Deep Sea Organisms, Bioluminescence/Biological Oceanography.

Outcomes: Dr. Tamara Frank served as a scientist in the face-to-face component of the FL Summer Institute in 2008 and in the Two-Day Workshop in FL in 2005.

Dr. Joel Kostka, Florida State University, Associate Professor, Area of Expertise: Biogeochemistry, Salt Marsh Ecology/Biological Oceanography.

Dr. Chris Simoniello, USM–Gulf of Mexico Ocean Observing System Education and Outreach and Outreach Coordinator, Area of Expertise: Coastal Ocean Observing Systems/Biological Oceanography/Education.

Outcomes: Dr. Chris Simoniello served as a scientist in the face-to-face component of the FL Summer Institute in 2005 and 2008; she served in the online component of the Summer Institute in 2005; and she served as a scientist in the Two-Day Workshop in FL in 2005.

Dr. Richard Tankersley, Florida Institute of Technology, Professor, Area of Expertise: Marine Invertebrates (horseshoe crab)/Biological Oceanography.

Outcomes: Dr. Richard Tankersley served as a scientist for the Two-Day Workshop in FL in 2009 and the face-to-face component of the FL Summer Institute in 2008.

Dr. Arnoldo Valle Levinson, University of Florida, Associate Professor, Area of Expertise: Estuarine Hydrodynamics/Physical Oceanography.

Mississippi Institute: Gulf Coast Research Laboratory–J.L. Scott Marine Education Center, June 22–27, 2008, Ocean Springs, MS

(Note: 12 teachers [eight inservice and four female preservice]—nine females and three males with 11 being Caucasian and one being African American [note: three teachers did not complete the course, two females and the African American male]; six scientists—two females and four males, all Caucasians).

Ms. Harriet Perry, USM, Department of Coastal Sciences, Associate Professor, Presentation: Watersheds (Population Dynamics of Various Marine/Estuarine Species).

Outcomes: Ms. Harriet Perry served as a scientist in the face-to-face component of the MS Summer Institute in 2004, 2006, and 2008; she served in the Two-Day Workshop in MS in 2003; and in the online component of the Summer Institute in 2003.

Dr. Richard Fulford, USM, Department of Coastal Sciences, Assistant Professor, Presentation: Fisheries Modeling for Food Web Interactions.

Outcomes: Dr. Richard Fulford served as a scientist in the face-to-face component of the MS Summer Institute in 2008 and as a Keynote presenter in the online component of the Summer Institute in 2007. Dr. Fulford is also a member of the COSEE CGOM Advisory Committee.

Dr. Karen Orcutt, USM, Department of Marine Science, Assistant Professor, Stennis Space Center, Presentation: Environmental Factors Regulating Nitrogen Fixation.

Outcomes: Dr. Karen Orcutt served as a scientist in the MS face-to-face component of the Summer Institute in 2008 and submitted an unsuccessful grant to NSF that included two, MS teachers from the face-to-face component of the MS 2008 Institute.

Dr. Steven Lohrenz, USM, Department of Marine Sciences, Professor, Stennis Space Center, Presentation: Biogeochemical Cycling of Nutrients and Carbon.

Outcomes: Dr. Steve Lohrenz served as a scientist in the face-to-face component of the MS Summer Institute in 2004 and 2006. Dr. Lohrenz also included his Post-doc, Suzanne Craig and graduate student, Megan Butterworth, as scientists in Mississippi's Summer Institute. Dr. Lohrenz officially became the Administrative PI for COSEE CGOM in July 2010 due to this grant not being able to transition with Dr. Walker when she resigned from the University of Southern Mississippi.

Dr. LaDon Swann, Director-MS-AL Sea Grant Consortium and Associate Professor-Auburn University, Ocean Springs, Presentation: Aquaculture.

Outcomes: Dr. LaDon Swann served as a scientist in the face-to-face component of the AL Summer Institute in 2005 and the MS Summer Institute in 2008.

Dr. Mark Konikoff, University of Louisiana at Lafayette, Associate Professor, Department of Biology, Presentation: Fisheries Diversity (Comparison of Two Habitats).

Outcomes: Dr. Mark Konikoff participated in the following COSEE CGOM events: he served as a scientist in the face-to-face Summer Institutes for 2007, 2008, and 2009. It should be noted Dr. Mark Konikoff requested in 2007 to be a face-to-face presenter for 2008 and 2009.

2008 Online Institute (Scientists and Affiliations):

(Note: Six scientists—two females and four males, all Caucasians)

Dr. Jessica Kastler, Research Associate, USM, Department of Coastal Sciences, Research Associate, Presentation: Gulf of Mexico: Understanding America's Sea.

Outcomes: Dr. Kastler is a Co-PI of COSEE CGOM and served as Keynote presenter for the online presentations in 2006, 2007, 2008, 2009, and 2010. Dr. Kastler also served as a presenter for the face-to-face component of the Summer Institute in LA in 2005 and 2006.

Dr. Tim Osborne, Regional Navigation Manager, NOAA Office of Gulf Survey, Lafayette, LA, Presentation: Gulf of Mexico Marine Debris Mapping Project.

Dr. Stephanie Showalter, Director—University of Mississippi Law Center, Presentation: Coastal Resiliency: Planning for Natural Variability and Recovering from Extreme Events.

Dr. Robert Shipp, University of South Alabama, Professor, Department of Marine Sciences, Presentation: Fish Stock and Mariculture.

Outcomes: Dr. Bob Shipp was a keynote presenter in the online component of the 2008 Summer Institute and he served as a scientist in the 2005 face-to-face component of the AL Summer Institute.

Dr. Mike Carron, Chief Scientist, Northern Gulf Institute, Presentation: Oceanography and Geographic Information Systems.

Outcomes: Dr. Mike Carron served as a Keynote online presenter in 2008 and 2009.

Dr. Mike Spranger, Associate Director for Extension and Education, University of Florida Sea Grant, Gainesville, FL, Presentation—Stewardship: Making a Difference in the Gulf of Mexico.

Outcomes: Dr. Spranger is a Co-PI of COSEE CGOM and served as Keynote presenter for the online presentations in 2003, 2005, 2008, 2009, and 2010.

2008 Two-Day Workshops (Scientists and Affiliations)

AL: The Dauphin Island Sea Lab, November 14–16, Dauphin Island, AL

(Note: There were 60 participants, 38 females and 17 males with one African American, 42 Caucasians, and 17 participants not providing ethnicity data. Twenty-nine participants received CEUs. Three scientists—one female and two males, all Caucasian.)

Dr. Tami Wells, University of South Alabama, Marsh Vegetation and GIS.

Outcomes: Dr. Tami Wells participated in the following COSEE CGOM events: 2004 and 2008 Two-Day Workshops; in 2004, 2005, and 2006 she served as a scientist in the face-to-face component of the MS Summer Institute; and in 2009 Dr. Wells was a scientist in the face-to-face component of the AL Summer Institute. Dr. Wells participated in the 2005 Joint MS-AL Two-Day Workshop.

Dr. Sean Powers, Dauphin Island Sea Lab, Fisheries Management.

Outcomes: Dr. Sean Powers served as a scientist in the face-to-face component of the AL Summer Institutes in 2005 and 2007 and also served as a scientist in the Two-Day Workshop in 2008.

Dr. Marcus Drymon, Dauphin Island Sea Lab, Fisheries.

Outcomes: Dr. Marcus Drymon was involved as a scientist in COSEE CGOM events: face-to-face component of the 2008 and 2009 Summer Institutes in AL and the 2008 Two-Day Workshop in AL.

LA : Audubon Institute Aquarium of the Americas, January 17–18. (Note: This was a November 2008, Two–Day Workshop which had to be re–scheduled.), New Orleans, LA
(Note: Fifty–two participants—including 40 females and 12 males, three African Americans and 49 Caucasians.)

Dr. Don Hauber, Professor, Loyola University New Orleans, Presentation: *Phragmites australis* (Giant Reed): The Good, the Bad, the Genetics.

Dr. Craig Hood, Professor, Loyola University New Orleans, Presentation: *Phragmites australis*: Aerial Photos and Methods of Research.

Dr. Frank Jordan, Associate Professor, Loyola University New Orleans, Presentation: *Phragmites australis*: As Habitat For Fish and Research Subject For Student Scientists.

Outcomes: Dr. Frank Jordan served as a scientist in the Two–Day Workshop in LA in 2003 and 2008. In 2007–2010 Dr. Jordan also became a LA Management Consultant when the LA Co–PI moved to MS.

FL: April 25–27, 2008, Tampa, FL

(Note: COSEE was a sponsor of this Two–Day PD Workshop, coordinated with the Florida Marine Science Education Association [FMSEA] Annual Meeting.) The FMSEA is one of the 17 chapters of the NMEA.

Dr. David Niebuhr, Vice President of Education, Mote Marine Laboratory, Sarasota, FL.

Dr. Randy Wells, Program Manager, Dolphin Research Program, Mote Marine Laboratory, Sarasota, FL.

Outcomes: Dr. Tami Wells participated in the following COSEE CGOM events: 2004 and 2008 Two–Day Workshops; in 2004, 2005, and 2006 she served as a scientist in the face–to–face component of the MS Summer Institute; and in 2009 Dr. Wells was a scientist in the face–to–face component of the AL Summer Institute. Dr. Wells participated in the 2005 Joint MS–AL Two–Day Workshop.

Mr. Craig Watson, Director, Florida Tropical Aquaculture Laboratory, Ruskin, FL.

2007

2007 face–to–face Summer Institutes (Scientists and Affiliations):

AL: Dauphin Island Sea Lab, June 3–8, Dauphin Island, AL

Dr. Asim Bej, University of Alabama, Professor, Birmingham, Presentation: Ocean Bacteria (*Vibrio*) Seafood Safety and Real Time PCR and Bacteria Plating of Gulf Sea Water For Microbial Identification.

Outcomes: Dr. Asim Bej served as a scientist in the face-to-face component of the AL Summer Institute in 2005 and 2007 and as a scientist in the Two-Day Joint Workshop in MS and AL in 2005.

Dr. Just Cebrian, Senior Marine Scientist, DISL and Assistant Professor, University of South Alabama, Department of Marine Sciences, Mobile, Presentation: Understanding the Effects of Anthropogenic Eutrophication on Coastal Ecosystems Service.

Outcomes: Dr. Just Cebrian served as a scientist in the face-to-face component of the Summer Institutes in AL in 2005, 2006, and 2007 and he served as a Keynote presenter for the online component of the Institute in 2006. Dr. Cebrian served as a scientist in the Two-Day Workshop in AL in 2007 (re-scheduled from 2006).

Dr. John Dindo, Senior Marine Scientist, DISL, Mobile, Presentation: Fisheries and Oceanography.

Outcomes: Dr. Dindo is a Co-PI of COSEE CGOM and served as Keynote presenter for the online presentations in 2005, 2008, 2009, and 2010 and a presenter in the face-to-face component of the AL Summer Institute in 2007.

Dr. Sean Powers, DISL, Senior Scientist, Associate Professor of Marine Sciences, Mobile, Presentation: Fisheries Management, Fisheries, and Oceanography.

Outcomes: Dr. Sean Powers served as a scientist in the face-to-face component of the AL Summer Institutes in 2005 and 2007 and also served as a scientist in the Two-Day Workshop in 2008.

Dr. John Valentine, DISL, Senior Marine Scientist and University of South Alabama, Associate Professor of Marine Sciences, Presentation: Biodiversity in the Mobile-Tensaw Delta: A Jewel in Denial.

Dr. Ruth Carmichael, DISL, Senior Marine Scientist, Presentation: Application of Ecological Data to Inform Management and Conservation of Horseshoe Crabs.

Mr. Marcus Drymon, Doctoral Student at University of South Alabama, Mobile, Presentation: Fisheries and Oceanography.

Outcomes: Dr. Marcus Drymon was involved as a scientist in COSEE CGOM events: face-to-face component of the 2008 and 2009 Summer Institutes in AL and the 2008 Two-Day Workshop in AL.

LA: Louisiana Universities Marine Consortium, June 24–29, Chauvin LA

(Note: Thirteen teachers—including one preservice teacher, with 11 females and two males, and 10 Caucasian, one African American and one undeclared.)

Dr. Mark Konikoff, University of LA, Lafayette, Associate Professor, Department of Biological Sciences, Area of Interest: Fisheries Biology.

Outcomes: Dr. Mark Konikoff participated in the following COSEE CGOM events: he served as a scientist in the face-to-face Summer Institutes for 2007, 2008, and 2009. It should be noted Dr. Mark Konikoff requested in 2007 to be a face-to-face presenter for 2008 and 2009..

Dr. Nazan Atilla, LUMCON, Cocodrie, Biological Scientist; Area of Interest: Benthic Ecology.

Ms. Melissa Baustian, LUMCON, Cocodrie, Macro-Invertebrate Scientist; Area of Interest: Benthic Ecology.

Dr. Jessica Kastler, LUMCON, Cocodrie, Education Director, Areas of Interest: Geology and Education.

Outcomes: Dr. Kastler is a Co-PI of COSEE CGOM and served as Keynote presenter for the online presentations in 2006, 2007, 2008, 2009, and 2010. Dr. Kastler also served as a presenter for the face-to-face component of the Summer Institute in LA in 2005 and 2006.

2007 Online Institute (Scientists and Affiliations):

Dr. Mark Luther, University of South Florida, Professor, St. Petersburg, Presentation: Using Ocean Observing Technology.

Mr. Jerry Enzler, Director, National Mississippi River and Aquarium, Dubuque, IA, Presentation: Role of Museums in Science Education.

Dr. Jessica Kastler, LUMCON, Cocodrie, Education Director, Presentation: Overview of the Gulf of Mexico.

Outcomes: Dr. Kastler is a Co-PI of COSEE CGOM and served as Keynote presenter for the online presentations in 2006, 2007, 2008, 2009, and 2010. Dr. Kastler also served as a presenter for the face-to-face component of the Summer Institute in LA in 2005 and 2006.

Dr. Richard Fulford, USM, Department of Coastal Sciences, Assistant Professor, Presentation: Fisheries in the Gulf of Mexico.

Outcomes: Dr. Richard Fulford served as a scientist in the face-to-face component of the MS Summer Institute in 2008 and as a Keynote presenter in the online component of the Summer Institute in 2007. Dr. Fulford is also a member of the COSEE CGOM Advisory Committee.

Dr. George Crozier, Executive Director and Professor, DISL and Professor University of South Alabama, Presentation: Ecotourism/Ecodevelopment.

Outcomes: Dr. George Crozier served as a Keynote presenter in the online component of the 2007 Summer Institute; he served as a scientist in the 2006 Two-Day Workshop in AL (re-

scheduled for 2007) and a scientist in the face-to-face component of the AL Summer Institute in 2005.

Dr. John Christy, University of Alabama, Professor, Earth Systems Science Center, Huntsville, Presentation: Searching for Climate Change.

2007 Two-Day Workshops (Scientists and Affiliations):

MS: Gulf Coast Research Laboratory–J.L. Scott Marine Education Center, November 9–11, Ocean Springs, MS

Dr. Julia Lytle, Retired, USM, Department Coastal Sciences, Professor, Presentation: Ocean and Human Health (Why Eating Seafood Is Healthy).

Outcomes: Dr. Judy Lytle served as a scientist in the 2007 and 2009 Two-Day Workshop in MS.

Dr. Crystal Johnson, USM, Department Coastal Sciences, Senior Researcher, Presentation: Ocean and Human Health (Oyster Harvesting and Impacts of *Vibrio, sp.*).

Outcomes: Dr. Crystal Johnson served as a scientist in the Two-Day Workshop in 2007 and 2009 in MS, and in the face-to-face component of the MS Summer Institute in 2006. Dr. Johnson is also serving as the COSEE CGOM case study.

Dr. Rich Aronson, Climate Change, University of Alabama, Senior Marine Scientist, Presentation: Climate Change.

Outcomes: Dr. Rich Aronson served as a scientist in the Two-Day Workshop in MS in 2007 and as a Keynote presenter in the 2004 online component of the Summer Institute.

FL: April 27–29, 2007, Naples, FL

Dr. Dennis Dukes, US Army Corps of Engineers, Ecosystem Restoration.

Mr. Michael Grunwald, Author *The Swamp: The Everglades and the Politics of Paradise*.

2006 face-to-face Summer Institutes (Scientists and Affiliations):

MS: Gulf Coast Research Laboratory–J.L. Scott Marine Education Center, June 18–23, Ocean Springs, MS

Ms. Tami Wells, USM, Department of Coastal Sciences, Research Associate, Presentation: Global Information and Positioning System (GIS/GPS) and Coastal Vegetation Restoration.

Outcomes: Dr. Tami Wells participated in the following COSEE CGOM events: 2004 and 2008 Two-Day Workshops; in 2004, 2005, and 2006 she served as a scientist in the face-to-face component of the MS Summer Institute; and in 2009 Dr. Wells was a scientist in the face-to-

face component of the AL Summer Institute. Dr. Wells participated in the 2005 Joint MS–AL Two–Day Workshop.

Mr. Joshua Cheshire, Graduate Student, Mississippi State University, Presentation: Invasive Species–*Phragmites* *sp.*

Ms. Harriet Perry, USM, Department of Coastal Sciences, Associate Professor, Presentation: Watersheds/Crab Migration.

Outcomes: Ms. Harriet Perry served as a scientist in the face–to–face component of the MS Summer Institute in 2004, 2006, and 2008; she served in the Two–Day Workshop in MS in 2003; and in the online component of the Summer Institute in 2003.

Mr. Mark Jarrett, U.S. Navy, Naval Oceanographic Office, Deputy Director of Operations, Presentation: Oceanographic Surveys (Biological, Geological, Physical, and Chemical).

Outcomes: Mr. Mark Jarrett served as a scientist in the face–to–face component of the Summer Institutes in MS in 2005 and 2006. Mr. Jarrett also coordinates all Sea Scholar Voyages as the U.S. Navy’s Senior Representative.

Dr. Steve Lohrenz, USM, Department of Marine Sciences, Professor, Presentation: Carbon Cycling and Phytoplankton.

Outcomes: Dr. Steve Lohrenz served as a scientist in the face–to–face component of the MS Summer Institute in 2004 and 2006. Dr. Lohrenz also included his Post–doc, Suzanne Craig and graduate student, Megan Butterworth, as scientists in Mississippi’s Summer Institute. Dr. Lohrenz officially became the Administrative PI for COSEE CGOM in July 2010 due to this grant not being able to transition with Dr. Walker when she resigned from the University of Southern Mississippi.

Dr. Crystal Johnson, USM, Department of Coastal Sciences, Senior Researcher, Oceans and Human Health (Oyster Harvesting and Impacts of *Vibrio* *sp.*).

Outcomes: Dr. Crystal Johnson served as a scientist in the Two–Day Workshop in 2007 and 2009 in MS, and in the face–to–face component of the MS Summer Institute in 2006. Dr. Johnson is also serving as the COSEE CGOM case study.

FL: June 18–23, Cedar Key, FL

Dr. Don Behringer, University of Florida, Department of Fisheries and Aquatic Sciences, Research Scientist, Area of Expertise: Lobster Biology and Fisheries Management.

Outcomes: Mr. Don Behringer served as a scientist in the face–to–face component of the FL Summer Institute in 2004, 2005, and 2008; he served as a scientist in the Two–Day Workshop in FL in 2006. Dr. Behringer is also a member of the COSEE CGOM Advisory Team.

Dr. Rich D'Amato, Elton College, Department of Engineering, Professor, Area of Expertise: Chemical Oceanography.

Dr. Charles Jacoby, University of Florida, Department of Fisheries and Aquatic Sciences, Assistant Professor, Area of Expertise: Fisheries Management and Invasive Species.

Outcomes: Dr. Charles Jacoby served as a scientist in the face-to-face component of the FL Summer Institute in 2003, 2004, and 2006 and he also served as a scientist in the Two-Day Workshop in FL and in the Joint MS and AL Two-Day Workshops in 2005.

Mr. Rich Abrams, Florida Department of Fish and Wildlife Conservation Commission, Education Specialist, Area of Expertise: Fisheries Management and Invasive Species.

Dr. Bill Hemme, St. Petersburg College. Coordinator, Environmental Studies, Area of Expertise: Biology and Environmental Sciences.

2006 Online Institute (Scientists and Affiliates):

Ms. Tomma Barnes, South FL Water Management District, Senior Environmental Scientist, Presentation: Hurricanes, Tsunamis, and Natural Disasters.

Dr. Crystal Johnson, USM, Department of Coastal Sciences, Senior Researcher, Presentation: Ocean and Human Health (Oyster Harvesting and Impacts of *Vibrio sp.*).

Outcomes: Dr. Crystal Johnson served as a scientist in the Two-Day Workshop in 2007 and 2009 in MS, and in the face-to-face component of the MS Summer Institute in 2006. Dr. Johnson is also serving as the COSEE CGOM case study.

Dr. Just Cebrian, Senior Marine Scientist, DISL and Assistant Professor, University of South Alabama, Presentation: Hurricane Impacts on AL Marshes, Sr. Marine Scientist, Presentation: Understanding the Effects of Anthropogenic Eutrophication Coastal Ecosystem Services.

Outcomes: Dr. Just Cebrian served as a scientist in the face-to-face component of the Summer Institutes in AL in 2005, 2006, and 2007 and he served as a Keynote presenter for the online component of the Institute in 2006. Dr. Cebrian served as a scientist in the Two-Day Workshop in AL in 2007 (re-scheduled from 2006).

Ms. Beth Jewell, NOAA Office of Education Einstein Fellow and West Springfield High School, NOAA Einstein Fellow and High School Teacher, Springfield, VA, Presentation: Storm Surges.

Dr. Jessica Kastler, LUMCON, Education Director, Cocodrie, LA, Presentation: Hurricane Impacts on LA Wetlands.

Outcomes: Dr. Kastler is a Co-PI of COSEE CGOM and served as Keynote presenter for the online presentations in 2006, 2007, 2008, 2009, and 2010. Dr. Kastler also served as a presenter for the face-to-face component of the Summer Institute in LA in 2005 and 2006.

Mr. Scott Gordan, MS Department of Marine Resources, Shellfish Bureau Director, Biloxi, MS, Presentation: Hurricane Impacts on Oyster Reefs in the MS Sound

Outcomes: Mr. Scott Gordon served as a scientist for the online component of the Summer Institute in 2003 and 2006.

2006 Two-Day Workshops (Scientists and Affiliations):

AL: The Dauphin Island Sea Lab, October 20–22, Dauphin Island, AL (Note: Rescheduled for Feb. 9–11, 2007 due to low enrollment)

Dr. George Crozier, Executive Director and Professor, DISL, Mobile, Presentation: Coastal Zone Management–Building Along the Coast–Who Pays for Insurance?

Outcomes: Dr. George Crozier served as a Keynote presenter in the online component of the 2007 Summer Institute; he served as a scientist in the 2006 Two-Day Workshop in AL (re-scheduled for 2007) and a scientist in the face-to-face component of the AL Summer Institute in 2005.

Dr. Sytske Kimball, University of South Alabama, Asst. Professor of Meteorology, Mobile, Presentation: Hurricane Structure and Hurricane Landfall.

Outcomes: Dr. Sytske Kimball served as a scientist in the face-to-face component of the AL Summer Institute in 2005 and in the Two-Day Workshop in AL in 2006.

Dr. Jim Chen, Louisiana State University, Associate Professor of Civil and Environmental Engineering, Presentation: Hurricane Impacts to Coastal Barrier Islands and the Mainland–How Do We Protect the Coast?

Captain David Yeager, Mobile Bay National Estuary Program, Mobile, Presentation: Results of the Invasive Species Surveys of Coastal Alabama and Mississippi.

Outcomes: Capt. David Yeager served as a scientist in the Two-Day Workshop in AL in 2004 and 2006.

Mr. Hugh MacIntyre, Sr. Marine Scientist, DISL, Mobile, Presentation: Harmful Algal Blooms: Distribution and Links to Human Activity.

Ms. Lee Yokel, Gulf of Mexico Program, Environmental Education Coordinator, Mobile, Presentation: Introduction to the Gulf of Mexico Alliance Education Network–How You Can Be Involved.

Dr. Just Cebrian, Senior Marine Scientist, DISL and Assistant Professor, University of South Alabama, Department of Marine Sciences, Mobile, Presentation: Restoration of Salt Marsh Ecosystems–Grasses to Classes.

Outcomes: Dr. Just Cebrian served as a scientist in the face-to-face component of the Summer Institutes in AL in 2005, 2006, and 2007 and he served as a Keynote presenter for the online component of the Institute in 2006. Dr. Cebrian served as a scientist in the Two-Day Workshop in AL in 2007 (re-scheduled from 2006).

LA: Louisiana Universities Marine Consortium, November 10–12, Chauvin, LA

(Note: Forty-one participants—including 29 females and 12 males. Ethnicity data were not collected.)

Mr. John Lopez, Coastal Sustainability Program Director, Lake Pontchartrain Basin Foundation, New Orleans, Presentation: Multiple Lines of Defense Coastal Resiliency in the Lake Pontchartrain Basin.

Dr. Nancy Rabalais, Executive Director and Professor, LUMCON, Cocodrie, Presentation: The MS River Watershed Enriching Nutrients into the Gulf of Mexico.

Outcomes: Dr. Nancy Rabalais served as a scientist in the Two-Day Workshop in LA in 2006; she served as a scientist in the face-to-face component of the Summer Workshop in LA in 2003 and 2004, and as a Keynote presenter in the online component of the Summer Institute in 2003 and 2004.

Mr. Al Naomi, U.S. Army Corps of Engineers, Senior Project Manager for the New Orleans District, New Orleans, Presentation: Hurricane Protection in South Louisiana—Progress Made Post-Katrina.

2005 face-to-face Institute (Scientists and Affiliations)

AL

Asim Bej – University of Alabama, Professor, Birmingham, Area of Expertise: Seafood Safety.

Outcomes: Dr. Asim Bej served as a scientist in the face-to-face component of the AL Summer Institute in 2005 and 2007 and as a scientist in the Two-Day Joint Workshop in MS and AL in 2005.

Just Cebrian – Senior Marine Scientist, DISL and Assistant Professor, University of South Alabama, Department of Marine Sciences, Mobile, Area of Expertise: Restoration of Salt Marsh Ecosystems.

Outcomes: Dr. Just Cebrian served as a scientist in the face-to-face component of the Summer Institutes in AL in 2005, 2006, and 2007 and he served as a Keynote presenter for the online component of the Institute in 2006. Dr. Cebrian served as a scientist in the Two-Day Workshop in AL in 2007 (re-scheduled from 2006).

George Crozier – Executive Director and Professor, DISL and Professor University of South Alabama, Area of Expertise: Ecotourism/Ecodevelopment.

Outcomes: Dr. George Crozier served as a Keynote presenter in the online component of the 2007 Summer Institute; he served as a scientist in the 2006 Two-Day Workshop in AL (re-scheduled for 2007) and a scientist in the face-to-face component of the AL Summer Institute in 2005.

Ken Heck – Chief Marine Scientist, Dauphin Island Sea Lab, Area of Expertise: Oysters and Estuarine Landscape Restoration.

Outcomes: Dr. Ken Heck served as a scientist for the face-to-face component of the Summer Institute in AL in 2005 and as a keynote presenter in the online component of the Summer Institute in 2009.

Tracy Jones – UT at Chattanooga, Area of Expertise: Geology.

Sytske Kimball – University of South Alabama, Asst. Professor of Meteorology, Mobile, Area of Expertise: Hurricane.

Outcomes: Dr. Sytske Kimball served as a scientist in the face-to-face component of the AL Summer Institute in 2005 and in the Two-Day Workshop in AL in 2006.

Sean Powers – Dauphin Island Sea Lab, Area of Expertise: Fisheries Management.

Outcomes: Dr. Sean Powers served as a scientist in the face-to-face component of the AL Summer Institutes in 2005 and 2007 and also served as a scientist in the Two-Day Workshop in 2008.

Bob Shipp – University of South Alabama, Professor, Department of Marine Sciences, Area of Expertise: Fish Management.

Outcomes: Dr. Bob Shipp was a keynote presenter in the online component of the 2008 Summer Institute and he served as a scientist in the 2005 face-to-face component of the AL Summer Institute.

LaDon Swann – Director-MS-AL Sea Grant Consortium and Associate Professor-Auburn University, Ocean Springs, Area of Expertise: Aquaculture.

Outcomes: Dr. LaDon Swann served as a scientist in the face-to-face component of the AL Summer Institute in 2005 and the MS Summer Institute in 2008.

FL

Don Behringer, University of Florida, Near Shore Marine and Estuarine Environments and Spiny Lobsters.

Outcomes: Mr. Don Behringer served as a scientist in the face-to-face component of the FL Summer Institute in 2004, 2005, and 2008; he served as a scientist in the Two-Day Workshop in FL in 2006. Dr. Behringer is also a member of the COSEE CGOM Advisory Team.

Scott Jackson, University of Florida–Sea Grant, Coastal Dune Lakes/Florida Ecosystem Management.

Mr. Scott Jackson served as a scientist in the face-to-face component of the Summer Institute in 2003 and 2005 in FL and the Two-Day Workshop in FL in 2004 and 2005.

Maia McGuire, Florida Sea Grant, Marine Education and Coastal Ecology.

Chris Simoniello, Florida Sea Grant, Southeast Atlantic Coastal Ocean Observing System.

Outcomes: Dr. Chris Simoniello served as a scientist in the face-to-face component of the FL Summer Institute in 2005 and 2008; she served in the online component of the Summer Institute in 2005; and she served as a scientist in the Two-Day Workshop in FL in 2005.

Bob Swett, Florida Sea Grant, Boating and Waterway Management Issues.

Outcomes: Bob Swett served as a scientist in the face-to-face component of the FL Summer Institute in 2005 and he served as a scientist in the FL Two-Day Workshop in 2003 and 2005.

LA June 12–17

Dr. Allyse Ferrara, Nichols State University, Fisheries.

Dr. Quentin Fontenot, Nichols State University, Water Quality.

Jessica Kastler, LUMCON, Geology.

Dr. Gary LaFleur, Nichols State University, Physiology.

Dr. Larry Rouse, Louisiana State University, Oceanography and Coastal Processes.

Dr. Glenn Thomas, Louisiana State University–Ag Center, Coastal Restoration and Fish Habitat.

MS July 31–August 5

Mark Jarrett, Naval Oceanographic Office–Stennis Space Center Physical, Geological, and Chemical Oceanography.

Outcomes: Mr. Mark Jarrett served as a scientist in the face-to-face component of the Summer Institutes in MS in 2005 and 2006. Mr. Jarrett also coordinates all Sea Scholar Voyages as the U.S. Navy’s Senior Representative.

Bruce Leybourne, Geostream Consulting, Plate Tectonics.

Outcomes: Mr. Bruce Leybourne served as a scientist in the Two-Day Workshop in MS in 2003 and 2009 and in the 2005 face-to-face component of the MS Summer Institute.

Tami Wells, Alabama Cooperative Extension System– Mobile, AL, GIS/Salt Marsh Vegetation.

Outcomes: Dr. Tami Wells participated in the following COSEE CGOM events: 2004 and 2008 Two-Day Workshops; in 2004, 2005, and 2006 she served as a scientist in the face-to-face component of the MS Summer Institute; and in 2009 Dr. Wells was a scientist in the face-to-face component of the AL Summer Institute. Dr. Wells participated in the 2005 Joint MS–AL Two-Day Workshop.

Thomas (Tom) Wissing, Naval Oceanographic Office–Stennis Space Center, Geological Oceanography/Coastal Morphology.

2005 Online Institute (Scientists and Affiliations)

Dr. Michael Spranger, University of Florida Sea Grant, Presentation: Environmental Stewardship in the Gulf of Mexico.

Outcomes: Dr. Spranger is a Co-PI of COSEE CGOM and served as Keynote presenter for the online presentations in 2003, 2005, 2008, 2009, and 2010.

Dr. Chris Simoniello, University of South Florida College of Marine Science, Presentation: Coastal Ocean Observing System.

Outcomes: Dr. Chris Simoniello served as a scientist in the face-to-face component of the FL Summer Institute in 2005 and 2008; she served in the online component of the Summer Institute in 2005; and she served as a scientist in the Two-Day Workshop in FL in 2005.

Dr. Jim Franks, Gulf Coast Research Laboratory, Presentation: Gulf of Mexico Sports Fisheries.

Todd Adams, Gulf Coast Research Laboratory–Marine Education Center, Presentation: Waves and Tsunamis.

Outcomes: Mr. Todd Adams served as a scientist in the 2005 online component of the Summer Institute and he served as a scientist in the MS Two-Day Workshop in 2004.

Dr. Gary Shaffer, Southeastern Louisiana University, Presentation: The Delta Cycle, Wetlands Loss, and Wetlands Restoration in Coastal Louisiana.

Outcomes: Dr. Gary Shaffer served as a scientist in the online component of the Summer Institute in 2005 and he served as a scientist in the Two-Day Workshop in LA in 2004.

Dr. John Dindo, Dauphin Island Sea Lab, Presentation: Alabama: It's for the Birds!

Outcomes: Dr. Dindo is a Co-PI of COSEE CGOM and served as Keynote presenter for the online presentations in 2005, 2008, 2009, and 2010 and a presenter in the face-to-face component of the AL Summer Institute in 2007.

2005 Two-Day Workshops (Scientists and Affiliations)

AL November 18–20 (Co-Hosted with MS)

Charles Jacoby, University of Florida, Presentation: Invasive Species.

Outcomes: Dr. Charles Jacoby served as a scientist in the face-to-face component of the FL Summer Institute in 2003, 2004, and 2006 and he also served as a scientist in the Two-Day Workshop in FL and in the Joint MS and AL Two-Day Workshops in 2005.

Tami Wells, Alabama Cooperative Extension System, Presentation: Invasive Species.

Outcomes: Dr. Tami Wells participated in the following COSEE CGOM events: 2004 and 2008 Two-Day Workshops; in 2004, 2005, and 2006 she served as a scientist in the face-to-face component of the MS Summer Institute; and in 2009 Dr. Wells was a scientist in the face-to-face component of the AL Summer Institute. Dr. Wells participated in the 2005 Joint MS-AL Two-Day Workshop.

Scott Spear, University of Alabama at Tuscaloosa, Presentation: Marine Biotechnology.

Dr. Asim Bej, University of Alabama, Professor, Birmingham, Presentation: Marine Biotechnology.

FL

Tamara Frank, Harbor Branch Oceanographic Institute, Optical and Structural Adaptations in Pelagic and Benthic Organisms in Dim Light Environments.

Outcomes: Dr. Tamara Frank served as a scientist in the face-to-face component of the FL Summer Institute in 2008 and in the Two-Day Workshop in FL in 2005.

Scott Jackson, University of Florida-Sea Grant, Coastal Dune Lakes/Florida Ecosystem Management.

Mr. Scott Jackson served as a scientist in the face-to-face component of the Summer Institute in 2003 and 2005 in FL and the Two-Day Workshop in FL in 2004 and 2005.

Charles Jacoby, University of Florida, Department of Fisheries and Aquatic Sciences, Estuarine and Coastal Ecology to Include Particle Flux and Demersal Zooplankton.

Outcomes: Dr. Charles Jacoby served as a scientist in the face-to-face component of the FL Summer Institute in 2003, 2004, and 2006 and he also served as a scientist in the Two-Day Workshop in FL and in the Joint MS and AL Two-Day Workshops in 2005.

2011 COSEE Decadal Review

Bill Lindbergh, University of Florida, Department of Fisheries and Aquatic Sciences, Marine Ecology, Behavioral Ecology, and Crustacean Biology.

Maia McGuire, Florida Sea Grant, Marine Education and Coastal Ecology.

Chris Simoniello, Florida Sea Grant, Southeast Atlantic Coastal Ocean Observing System.

Outcomes: Dr. Chris Simoniello served as a scientist in the face-to-face component of the FL Summer Institute in 2005 and 2008; she served in the online component of the Summer Institute in 2005; and she served as a scientist in the Two-Day Workshop in FL in 2005.

Bob Swett, Florida Sea Grant, Boating and Waterway Management Issues.

Outcomes: Bob Swett served as a scientist in the face-to-face component of the FL Summer Institute in 2005 and he served as a scientist in the FL Two-Day Workshop in 2003 and 2005.

Deanna Wilson-Diaz, RSMAS, Miami, Remote Sensing and Its Application to Problems in Physical, Biological, and Chemical Oceanography.

LA – No Two-Day Workshop due to *Hurricane Katrina*.

MS November 18–20 (Co-Hosted with AL)

Charles Jacoby, University of Florida, Presentation: Invasive Species.

Outcomes: Dr. Charles Jacoby served as a scientist in the face-to-face component of the FL Summer Institute in 2003, 2004, and 2006 and he also served as a scientist in the Two-Day Workshop in FL and in the Joint MS and AL Two-Day Workshops in 2005.

Tami Wells, Alabama Cooperative Extension System, Presentation: Invasive Species.

Outcomes: Dr. Tami Wells participated in the following COSEE CGOM events: 2004 and 2008 Two-Day Workshops; in 2004, 2005, and 2006 she served as a scientist in the face-to-face component of the MS Summer Institute; and in 2009 Dr. Wells was a scientist in the face-to-face component of the AL Summer Institute. Dr. Wells participated in the 2005 Joint MS-AL Two-Day Workshop.

Scott Spear, University of Alabama at Tuscaloosa, Presentation: Marine Biotechnology.

Dr. Asim Bej, University of Alabama, Professor, Birmingham, Presentation: Marine Biotechnology.

2004 face-to-face Institute (Scientists and Affiliations)

FL

Donald Behringer, University of Florida, Near Shore Marine and Estuarine Environments and Spiny Lobsters.

Outcomes: Mr. Don Behringer served as a scientist in the face-to-face component of the FL Summer Institute in 2004, 2005, and 2008; he served as a scientist in the Two-Day Workshop in FL in 2006. Dr. Behringer is also a member of the COSEE CGOM Advisory Team.

Charles Jacoby, University of Florida–Sea Grant, Invasive Species.

Outcomes: Dr. Charles Jacoby served as a scientist in the face-to-face component of the FL Summer Institute in 2003, 2004, and 2006 and he also served as a scientist in the Two-Day Workshop in FL and in the Joint MS and AL Two-Day Workshops in 2005.

Scott Jackson, University of Florida–Sea Grant, Coastal Dune Lakes/Florida Ecosystem Management.

Mr. Scott Jackson served as a scientist in the face-to-face component of the Summer Institute in 2003 and 2005 in FL and the Two-Day Workshop in FL in 2004 and 2005.

Ellen Raabe, United States Geological Survey, Remote Sensing, Ecological Indicators, Habitat Loss, and GIS

LA June 20–25

Sam Bently, Louisiana State University–Coastal Studies Institute, Sedimentology.

Robert Carney, Louisiana State University–Coastal Studies Institute, Deep Sea Invertebrates.

Outcomes: Dr. Robert Carney served as a scientist in the face-to-face component of the Summer Institute in LA in 2004 and he also served as the scientist the Two-Day Workshop in MS in 2004.

Robert Gambrell, Louisiana State University, Wetland Chemistry.

Stefan L. Givens, Louisiana State University–Ag Center, Soil Sciences.

Sean Keenan, Louisiana State University–Coastal Fisheries Institute, Fisheries Biology.

Mark Konikoff, ULL, Fisheries Biology.

Outcomes: Dr. Mark Konikoff participated in the following COSEE CGOM events: he served as a scientist in the face-to-face Summer Institutes for 2007, 2008, and 2009. It should be noted Dr. Mark Konikoff requested in 2007 to be a face-to-face presenter for 2008 and 2009.

Andy Nyman, Louisiana State University, Marshes/Wetlands.

Julie Prerost, Louisiana State University–LUMCON, Coastal Invertebrates.

Alexandru Sheremet, Louisiana State University–Coastal Studies Institute, Wave Physics.

Jim Cowan, Louisiana State University, Fisheries Biology.

Nancy Rabalais, LUMCON, Gulf of Mexico Hypoxia.

Outcomes: Dr. Nancy Rabalais served as a scientist in the Two-Day Workshop in LA in 2006; she served as a scientist in the face-to-face component of the Summer Workshop in LA in 2003 and 2004, and as a Keynote presenter in the online component of the Summer Institute in 2003 and 2004.

MS

Leah Bray, Mississippi Department of Marine Resources, Deer Island Restoration/Coastal Ecology.

Chris Bridger, New Foundland Aquaculture Industry Assn., Offshore Aquaculture.

Outcomes: Dr. Chris Bridger served as a scientist in the face-to-face component of the Summer Institute in MS in 2003 and 2004.

Shelia Brown, Marine Education Center, Deep Sea Habitats/Ocean Zonation.

Outcomes: Dr. Shelia Brown served as a scientist for the online component of the Summer Institute in 2003 and she also served as a scientist in the face-to-face component of the Summer Institute in 2004.

Quent Burge, Naval Oceanographic Office, Physical Oceanographer NAVOCEANO.

Megan Butterworth, University of Southern Mississippi, Optical Detection and Assessment of Harmful Algal Blooms.

Outcomes: Ms. Butterworth was a graduate student of Dr. Steve Lohrenz's and he approved her serving as a scientist in the 2006 face-to-face component of the Summer Institute in MS.

Susanne Craig, University of Southern Mississippi, Optical Detection and Assessment of Harmful Algal Blooms.

Outcomes: Ms. Craig was a graduate student of Dr. Steve Lohrenz's and he approved her serving as a scientist in the 2006 face-to-face component of the Summer Institute in MS.

Steve Lohrenz, University of Southern Mississippi, Application of Remot Sensing, in Situ Optical Measurements and Models for Description of Primary Production and Phytoplankton Distributions and Optical Assessment of Air-Sea Carbon Fluxes in River-Dominated Margins.

Outcomes: Dr. Steve Lohrenz served as a scientist in the face-to-face component of the MS Summer Institute in 2004 and 2006. Dr. Lohrenz also included his Post-doc, Suzanne Craig and graduate student, Megan Butterworth, as scientists in Mississippi's Summer Institute. Dr.

Lohrenz officially became the Administrative PI for COSEE CGOM in July 2010 due to this grant not being able to transition with Dr. Walker when she resigned from the University of Southern Mississippi.

Kevin McKone, Copiah Lincoln Community College, Physical Oceanographer Naval Oceanographic Office.

Harriet Perry, Gulf Coast Research Laboratory, Crab Life History and Migration Patterns.

Outcomes: Ms. Harriet Perry served as a scientist in the face-to-face component of the MS Summer Institute in 2004, 2006, and 2008; she served in the Two-Day Workshop in MS in 2003; and in the online component of the Summer Institute in 2003.

James Robinson, Naval Oceanographic Office, Physical Oceanographer NAVOCEANO.

Rebecca Smith, Naval Oceanographic Office, Technology in Hydrographic Surveys.

Tom Vandevender, Mississippi Department of Marine Resources, Fisheries Management.

Tami Wells, Gulf Coast Research Laboratory, GIS/Marsh Vegetation Restoration.

Outcomes: Dr. Tami Wells participated in the following COSEE CGOM events: 2004 and 2008 Two-Day Workshops; in 2004, 2005, and 2006 she served as a scientist in the face-to-face component of the MS Summer Institute; and in 2009 Dr. Wells was a scientist in the face-to-face component of the AL Summer Institute. Dr. Wells participated in the 2005 Joint MS-AL Two-Day Workshop.

2004 Online Institute (Scientists and Affiliations)

Richard Aronson, University of South Alabama, Presentation: Coral Reef Ecology.

Outcomes: Dr. Rich Aronson served as a scientist in the Two-Day Workshop in MS in 2007 and as a Keynote presenter in the 2004 online component of the Summer Institute.

Dr. Nancy Rabalais, Louisiana Universities Marine Consortium, Presentation: Hypoxia in the Gulf of Mexico.

Outcomes: Dr. Nancy Rabalais served as a scientist in the Two-Day Workshop in LA in 2006; she served as a scientist in the face-to-face component of the Summer Workshop in LA in 2003 and 2004, and as a Keynote presenter in the online component of the Summer Institute in 2003 and 2004.

George Burgess, University of Florida, Presentation: Sharks!

Dr. John Valentine, University of South Alabama, Presentation: Submerged Aquatic Vegetation.

Dr. Joan Holt, University of Texas, Presentation: Coral Reef Fish Culture and Research.

Dr. Chuck Fisher, University of Pennsylvania, Presentation: Methane Seep Habitats of the Gulf of Mexico.

2004 Two-Day Workshops (Scientists and Affiliations)

LA November 19–21

Mr. Robert Ariatti, U.S. Army Corps of Engineers, Coastal Restoration.

Mr. Andrew Barron, Barataria Terrebonne National Estuary Program, Coastal Restoration.

Outcomes: Mr. Andrew Barron was a presenter at the Two-Day Workshop in LA in 2004, as well as a face-to-face scientist during the 2003 and 2009 LA Summer Institute. Mr. Barron also served as an online presenter in 2007.

Ms. Joni Blanchard, Barataria Terrebonne National Estuary Program, Coastal Restoration.

Mr. Brad Miller, Louisiana Department of Natural Resources, Coastal Restoration.

Dr. Gary Shaffer, Southeastern Louisiana University, Deltas, Land Loss, & Restoration in Louisiana.

Outcomes: Dr. Gary Shaffer served as a scientist in the online component of the Summer Institute in 2005 and he served as a scientist in the Two-Day Workshop in LA in 2004.

MS March 4–5 Note: This Two-Day Workshop was originally scheduled for November 6–7, 2003.

MS Kay Baggett, Marine Education Center, Red Drum–Yum!

Bill Burnett, Naval Meteorology and Oceanography Command, What's New in Hurricanes.

Becky Espey, Marine Education Center, Invasive Species.

Jennifer Hale, Marine Education Center, Marine Polymer–Chiosan.

Ms. Jennifer Hale served as a science educator in the Two-Day Workshop in MS in 2003 (originally scheduled for November 2003) and 2004.

Chris Snyder, Marine Education Center, Alabama–Mississippi Rapid Assessment TEAM (AMRAT) in Mobile Bay.

Mr. Chris Snyder served as a science educator in the Two-Day Workshop in MS in 2003 (originally scheduled for November 2003 and actually implemented in March 2004) and 2004.

David Yeager, Mobile Bay National Estuary Program, Alabama–Mississippi Rapid Assessment TEAM (AMRAT)

Outcomes: Capt. David Yeager served as a scientist in the Two-Day Workshop in AL in 2004 and 2006.

MS December 2–3

Todd Adams, Gulf Coast Research Laboratory, Presentation: A Grain of Sand; A Drop of Water.

Outcomes: Mr. Todd Adams served as a scientist in the 2005 online component of the Summer Institute and he served as a scientist in the MS Two-Day Workshop in 2004.

Chris Snyder, Gulf Coast Research Laboratory, Presentation: AL/MS Rapid Assessment Team.

Mr. Chris Snyder served as a science educator in the Two-Day Workshop in MS in 2003 (originally scheduled for November 2003 and actually implemented in March 2004) and 2004.

Jennifer Hale, Gulf Coast Research Laboratory, Presentation: Biology of Hydrothermal Vents and Seep Worms.

Ms. Jennifer Hale served as a science educator in the Two-Day Workshop in MS in 2003 (originally scheduled for November 2003) and 2004.

Tami Wells, Alabama Cooperative Extension System, Techniques in Coastal Restoration.

Outcomes: Dr. Tami Wells participated in the following COSEE CGOM events: 2004 and 2008 Two-Day Workshops; in 2004, 2005, and 2006 she served as a scientist in the face-to-face component of the MS Summer Institute; and in 2009 Dr. Wells was a scientist in the face-to-face component of the AL Summer Institute. Dr. Wells participated in the 2005 Joint MS-AL Two-Day Workshop.

Susan Rees, U.S. Army Corps of Engineers-Mobile, AL, Presentation: Deer Island Restoration.

Dr. Robert Carney, Louisiana State University, Presentation: Muck, Oil Seeps, and Hydrothermal Vents: The Seldom Seen Pervasive Ecology of Sulfate Reduction.

Outcomes: Dr. Robert Carney served as a scientist in the face-to-face component of the Summer Institute in LA in 2004 and he also served as the scientist the Two-Day Workshop in MS in 2004.

Dr. Tom Garrison, Orange County Community College, Presentation: An Ocean Overview: Past, Present, and Future.

Outcomes: Dr. Tom Garrison served as a scientist in the face-to-face component of the Two-Day Workshop in MS in 2003 and 2004 and he also served as a Keynote presenter for the online component of the Summer Institute in 2003.

2003 Face-to-Face Institutes (Scientists and Affiliations)

LA June 22–27

Andrew Barron, Barataria–Terrebonne National Estuary Program, Water Quality.

Outcomes: Mr. Andrew Barron was a presenter at the Two–Day Workshop in LA in 2004, as well as a face–to–face scientist during the 2003 and 2009 LA Summer Institute. Mr. Barron also served as an online presenter in 2007.

Sam Bentley, Louisiana State University, Coastal Geology.

Nicole Crochet, LUMCON, Deep Water Fisheries.

Allyse Ferrara, Nichols State University, Coastal Fisheries.

Frank Jordan, Loyola University, Salt Marsh Fisheries.

Outcomes: Dr. Frank Jordan served as a scientist in the Two–Day Workshop in LA in 2003 and 2008. In 2007–2010 Dr. Jordan also became a LA Management Consultant when the LA Co–PI moved to MS.

Nancy Rabalais, LUMCON, Hypoxia in the Gulf of Mexico.

Outcomes: Dr. Nancy Rabalais served as a scientist in the Two–Day Workshop in LA in 2006; she served as a scientist in the face–to–face component of the Summer Workshop in LA in 2003 and 2004, and as a Keynote presenter in the online component of the Summer Institute in 2003 and 2004.

FL June 22–27 Cedar Key

Jeff DiMaggio, Waccassasa Bay State Preserve, Presentation: Waccassasa Bay and Cedar Key Scrub Habitats—Current Issues and Concerns and Future Challenges.

Grady McCleod, Cedar Key Historical Museum, Presentation: History of Cedar Key.

Albert Fuller, Levy County Extension, Presentation: Pontoon Boat Trip Guide.

Scott Jackson, Florida Sea Grant, Presentation: Canoe trip into Marsh Channels Guide.

Mr. Scott Jackson served as a scientist in the face–to–face component of the Summer Institute in 2003 and 2005 in FL and the Two–Day Workshop in FL in 2004 and 2005.

Dr. Charles Jacoby, University of Florida, Presentation: Canoe Trip into Marsh Channels Guide.

Outcomes: Dr. Charles Jacoby served as a scientist in the face–to–face component of the FL Summer Institute in 2003, 2004, and 2006 and he also served as a scientist in the Two–Day Workshop in FL and in the Joint MS and AL Two–Day Workshops in 2005.

Dr. Robert Mattson, Lower Suwanee and Cedar Keys National Wildlife Refuges Presentation: Salt Marsh Ecology & Habitats.

Pam Darty, Lower Suwanee and Cedar Keys National Wildlife Reuges, Presentation: Field Trip Guide.

Dr. Jerry Culen, Florida 4-H, Presentation: Investigating Marine Issues in the Classroom.

Leslie Strumer, Shellish Aquaculture Extension Program, Presentation: Aquaculture.

Bob Swett, Florida Sea Grant, Presentation: Sea Grant GIS Cartography Lab.

Outcomes: Bob Swett served as a scientist in the face-to-face component of the FL Summer Institute in 2005 and he served as a scientist in the FL Two-Day Workshop in 2003 and 2005.

MS June 15–20 Biloxi

Chris Bridger, Gulf Coast Research Laboratory, Presentation: Offshore Aquaculture.

Outcomes: Dr. Chris Bridger served as a scientist in the face-to-face component of the Summer Institute in MS in 2003 and 2004.

Mia Erickson, Naval Oceanography Command–U.S. Navy, Presentation: Oceanography.

Bruce A. Leybourne, U.S. Navy, Presentation: Plate Tectonics.

Outcomes: Mr. Bruce Leybourne served as a scientist in the Two-Day Workshop in MS in 2003 and 2009 and in the 2005 face-to-face component of the MS Summer Institute.

Ms. Trisha Lowery, Naval Oceanography Command–U.S. Navy, Presentation: Oceanography.

Adria R. McClain, Naval Oceanography Command–U.S. Navy, Presentation: Oceanography.

Bruce Northridge, Command Naval Meteorology and Oceanography Command–U.S. Navy, Presentation, Oceanography/Technology Transitions.

Harriet Perry, Gulf Coast Research Laboratory, Presentation: Crab Migration.

Outcomes: Ms. Harriet Perry served as a scientist in the face-to-face component of the MS Summer Institute in 2004, 2006, and 2008; she served in the Two-Day Workshop in MS in 2003; and in the online component of the Summer Institute in 2003.

Ruth Posadas, Mississippi Department of Marine Resources, Presentation: Seafood Safety.

Dr. Tom Garrison, Orange County Community College, Presentation: Oceanography: The Big Picture!

Outcomes: Dr. Tom Garrison served as a scientist in the face-to-face component of the Two-Day Workshop in MS in 2003 and 2004 and he also served as a Keynote presenter for the online component of the Summer Institute in 2003.

2003 Online Institute (Scientists and Affiliates):

Dr. Sharon Walker, Gulf Coast Research Laboratory–Marine Education Center, Presentation: Coral Reef Ecology.

Dr. Nancy Rabalais, Louisiana Universities Marine Consortium, Presentation: Gulf of Mexico Hypoxia.

Outcomes: Dr. Nancy Rabalais served as a scientist in the Two-Day Workshop in LA in 2006; she served as a scientist in the face-to-face component of the Summer Workshop in LA in 2003 and 2004, and as a Keynote presenter in the online component of the Summer Institute in 2003 and 2004.

Dr. Frank Hall, University of New Orleans, Presentation: Ocean Floor.

Kristen Larsen, Gulf Coast Research Laboratory, Presentation: Fisheries Biology.

Tom Garrison, Orange County Community College, Presentation: Oceanography: The Big Picture!

Outcomes: Dr. Tom Garrison served as a scientist in the face-to-face component of the Two-Day Workshop in MS in 2003 and 2004 and he also served as a Keynote presenter for the online component of the Summer Institute in 2003.

Harriet Perry, Gulf Coast Research Laboratory, Presentation: Aquatic Nuisance Species.

Outcomes: Ms. Harriet Perry served as a scientist in the face-to-face component of the MS Summer Institute in 2004, 2006, and 2008; she served in the Two-Day Workshop in MS in 2003; and in the online component of the Summer Institute in 2003.

George Burgess, University of Florida, Presentation: Sharks!

Dr. Shelia Brown, Gulf Coast Research Laboratory, Presentation: The Abyss and Other Deep Ocean Habitats.

Outcomes: Dr. Shelia Brown served as a scientist for the online component of the Summer Institute in 2003 and she also served as a scientist in the face-to-face component of the Summer Institute in 2004.

Dr. Mike Spranger, University of Florida Sea Grant, Presentation: Stewardship and Sense of Place in the Gulf of Mexico.

Outcomes: Dr. Spranger is a Co-PI of COSEE CGOM and served as Keynote presenter for the online presentations in 2003, 2005, 2008, 2009, and 2010.

Scott Gordon, MS Department of Marine Resources, Presentation: Oysters.

Outcomes: Mr. Scott Gordon served as a scientist for the online component of the Summer Institute in 2003 and 2006.

2003 Two-Day Workshops (Scientists and Affiliations)

LA November 14–15

CDR. Chris Kent, Stennis Space Center, Tropical Cyclones.

Dr. Robert Twilley, University of Louisiana–Lafayette, Global Climate Change in Gulf Coast Region: Concepts in Earth System and Restoration of Coastal Louisiana: Concepts in Ecosystem Science.

MS November 6–7, 2003 Two-Day Workshop was rescheduled for March 4–5, 2004 (see presenter for March 4–5, 2004).

COSEE Florida (2002)

Supporting Scientists to Make Education Presentations

Dr. Frank Muller Karger did the Keynote presentation at the annual conference of the *Association of Science Teacher Education* in Portland, Oregon. The audience of about 600 consisted of primarily university science education professors responsible for teacher education in the United States and beyond. January 12, 2006. The COSEE–Florida banner funded by USGS was displayed.

Dr. Frank Muller Karger, & Mark Luther did a Plenary session presentation at the Annual conference of the *International Association Science Technology Society* in Baltimore. The audience consisted of about 150 educators from all levels who focus on the interaction of science, technology, and society, 2005.

Dr. Frank Muller Karger presented a concurrent session at the annual meeting of the *Florida Science Teachers Association* in Orlando. The audience consisted of about 70 science teachers in Orlando, Oct 15–16, 2004. *The U.S. Commission on Ocean Policy's Education Recommendations Inspire COSEE Teacher/Researcher Connections!*

Dr. Frank Muller–Karger presented a Keynote address at the Southeast Association for the Education of Teachers of Science, *The U.S. Commission on Ocean Policy Report: Major Implications for the Science Teacher Educator* October 22–23, 2004 Gainesville, FL

COSEE Florida assisted the following scientists with development of Criterion 2 – Broader Impact sections of grant proposals: Drs. Pam Muller, Frank Muller–Karger, David Fries, Bob Weisburg, Boris Galperin, Luis Garcia–Rubio, Lisa Robbins.

Formal Education Opportunities for Scientists

Courses

COSEE Florida developed and implemented two **graduate certificate programs** at the University of South Florida that educated scientists and other stakeholders about ways to collaborate in bringing ocean sciences to impact education. Both certificate programs were pilot tested with face-to-face classes of between eight and fifteen professionals. The first certificate was a series of five, three credit courses titled, *Community Building in Ocean Sciences*. The second certificate was a series of four, three credit courses, titled *Informal Science Institutions Marine and Environmental Education*. This latter certificate is now available fully online. Materials from COSIA are included in this program. Learning opportunities involved site explorations at Tampa Bay area aquariums and laboratories including the Florida Aquarium, the Pier Aquarium, and MOTE Marine Laboratory, Fish and Wildlife Research Institute Laboratories, among others. Dr. Spector was the instructor of record for these courses. They were, however, developed by twenty three partners.

Enabling Scientists to Disseminate Research

Exhibits

COSEE Florida assisted scientists in developing exhibits displaying their research at the Pier Aquarium in St. Petersburg: One was titled, *Ocean's the Big Picture*. It focused on remote sensing (Dr. Frank Muller-Karger). The second was *Sea of Sound*. (October 2005) It focused on passive acoustic monitoring of sport fish communication in Tampa Bay (Dr. David Mann). A third exhibit was placed at Campbell Park Elementary Marine Science Center titled, *Coastal Ocean Monitoring and Prediction Sensor*. The unveiling of these exhibits each received local media exposure.

Web Portal

COSEE Florida developed a web portal. This enabled communication among ocean science stakeholders and the public, and archiving ocean science information throughout the state.

During fall semester, 2005, a group of nine stakeholders participated in the COSEE-FL sponsored three-credit graduate "Seminar on Ocean Science education" orchestrated by Dr. Spector. This course was part of the Community Building series. The topics in this course were directed toward forwarding varied activities of COSEE-FL. The seminar enabled participants to learn to use and debug the newest aspects of the COSEE-FL portal online "live access" classroom.

The COSEE-FL web portal had multiple functions available to the ocean science community that were not available at that time through one portal anywhere else we could identify. Our original portal Beta tested in 2004 was a database with a search engine and no other features. The 2006 portal was a combination of a database, a full-featured content management system (CMS), a learning management system (LMS), and a live conferencing system. The portal consisted of 3 major open source components – Mambo/Joomla Content Management; MOODLE Learning Management; and Network EducationWare conferencing system. Included in the CMS and LMS were over 150 modules that perform a variety of tasks, including news feed scroll, 20+ discussion boards, web imaging delivery, multiple search engines, a document management system, a project manager, user controls, several content calendar and event systems, internal and external messaging and mail systems, automated newsletter development and delivery, secure tunnel communications, audio-graphics controls, video feeds and streaming, full conferencing recordings, blogging, resource controls and many more. One of the uniqueness' of this system was it is composed of all open-source software that took hundreds of hours of creative effort to synthesize into one working entity.

COSEE Florida assisted communication among leading ocean scientists across Florida to develop Florida's Ocean Policy by developing and providing electronic support to bring the scientists' meetings to the public. This was a collaboration between COSEE Florida and the Department of Environmental Protection. The COSEE-FL web portal was used as the official virtual communication system for Florida's Ocean and Coastal Resource Council. In addition to facilitating electronic meetings among Council members, we provided access for the public to participate, and we record the meetings.

COSEE Florida supported simultaneous broadcast and recording, via the COSEE–FL Web Portal, of the series of brown bag luncheon seminars conducted in round robin at USGS, NOAA, NMFS, FWRI, and USF throughout FY 06–07, organized by Drs. Chris D’Elia and Frank Muller–Karger. This expanded participation by including audiences at a distance in these sessions. For example, teachers and students in a school, operations managers, etc. participated at no cost from their work sites using their desktop computers. The recordings were incorporated into educational materials for distribution via the portal.

Informal Science Institutions

COSEE Florida orchestrated an Informal Science Education Summit at Florida Aquarium May 19, 2006 in which about fifty representatives of informal science education organizations in the Tampa Bay area participated. One outcome was the formation of an *Informal Science Education Institutions Network*. Another outcome was expanded content for the *Informal Science Institutions Marine and Environmental Education Graduate Certificate Program*.

Workshops

COSEE Florida convened a two–day workshop for university science education professors from across the state to explore ways to infuse ocean sciences in university teacher education programs at their institutions. These professors visited the laboratories in the College of Marine Science and discussed the research with the scientists in each laboratory, 2004.

COSEE Florida initiated and supported the development of MOST, *Minority Ocean Science Teachers*, a cadre of about twenty teachers serving predominantly African American middle and high school audiences in Big Bend area of north Florida to infuse ocean sciences in all the courses they taught. Through partnership with the *Joseph Foundation*, COSEE Florida enabled these teachers to come to USF and interact with researchers in the College of Marine Science Laboratories for three days. Ongoing communications ensued between individual teachers and various scientists. We provided a workshop on the marine science textbook, *Life On An Ocean Planet*. COSEE–FL connected the MOST teachers with an additional workshop in January, 2006 at the Florida Department of Environmental Protection.

COSEE Florida participated in *Preservice Teachers IVC Project MOTE Marine Laboratory* July 29–Aug 1, 2007 PI– D. Niebur.

SEACOOS Summer Physical Science Workshop *Boats, Buoys, and Science Teachers: A Winning Combination* weeklong workshop at USF developed and pilot tested by C. Leard.

Eight one–day workshops were implemented throughout the state, from the extreme northern end to the southern tip and east to west coast of Florida for secondary science teachers. Florida Sea Grant partnered with COSEE–FL for three of SEPORT workshops during 2006.

Reception

COSEE Florida hosted a reception at the Pier Aquarium for the National Marine Education Association’s annual conference to which area marine scientists participated.

Distance Learning

COSEE–Florida facilitated converting four ocean science courses to distance learning with support from a USF Provost office grant to the Coordinator Research Program/Services in the College of Marine Science: Physical oceanography, Geological oceanography, Biological oceanography, and Environmental Sensor Technology.

DVD

COSEE Florida with supplemental support from the Southeast Atlantic Coastal Ocean Observing System (SEACOOS) produced a DVD explaining coastal ocean observing and distributed it to formal and informal educators and local politicians. The DVD featured College of Marine Science Ocean Observing researchers and technicians.

Case Studies

COSEE Florida with supplemental support from SEACOOS produced a series of six video case study interviews with scientists in the College of Marine Science that were disseminated to educators and the public through the SEACOOS and SEACOORA website.

COSEE Florida developed written case studies of marine scientists telling “stories” about their research for use by educators at all levels. (e.g., Dr. Al Hine, College of Marine Science; Dr. Katherine Andrews, Florida Department of Environmental Protection) 2004–2005

COSEE Florida interviewed twenty scientists in the College of Marine Science in 2004 to foster involvement of ocean scientists with COSEE Florida. Information from the interviews was used to compile an overview of ocean scientists’ interests, concerns, and perspectives with regard to their own research and the COSEE initiative. It guided COSEE Florida decisions for initiatives to add “value” for the scientists. The information was also used to introduce these scientists’ work and perspectives to learners in the *Informal Science Institutions Environmental Education Graduate Certificate Program*. Scientists included the following: Drs. Peter Betzer, Bob Byrne, Ken Carter, Kendra Daly, Kent Fanning, Ben Flower, Boris Galperin, Al Hine, Dave Hollander, Peter Hows, Mark Luther, Frank Muller–Karger, John Paul, Dave Mann, Gary Mitchum, Pam Muller, Ashanti Pyrtle, Terry Quinn, Ted Van Vleet, & Bob Weisburg.

State Ocean Celebration

COSEE Florida had a booth at the state’s Ocean’s Day in Tallahassee for three years in which projects with Florida scientists were displayed 2004, 2005,2006.

Other Projects

COSEE Florida educators assisted ocean observing system graduate students and from IMARS laboratory staff in the College of Marine Science to develop educational projects and write grant proposals.

Public Service Announcement

COSEE–Florida developed a public service announcement informing the public about the importance of ocean sciences that aired all across the state for several months on public television.

Wrote letters of support and participated in concept development of the following grant proposals:

Office of Naval Research. Understand, identify gaps, and predict changes in the workforce for ocean science, technology, and operations Submitted by Manfred Zapaka–Marc M. Siah and Associates Inc.– Hawaii. M Zapaka PI, B. Spector Consultant, January 2006

Science through the Eyes of a Fish: Investigating the Technologies of the Underwater World – PIs Lundi Spence and Andrew Shephard to NOAA Undersea Research Center for the Southeast and Gulf of Mexico Region \$ 600,000 March 1, 2006

National Ocean and Atmospheric Administration (NOAA) Office of Ocean Exploration. Extending Ocean Exploration for Teachers–. Submitted by The Pier Aquarium H. Rutherford PI, B. Spector CO–I. \$50,000. (not funded)

National Ocean and Atmospheric Administration (NOAA). Educators and Ocean Scientists: Charting a Course to Improve the Teaching and Learning of Science in South Florida’s High–Need Secondary Schools. Submitted by Florida Atlantic University, Julie Lambert PI, B. Spector Consultant. \$495,681 (recommended for revision and resubmission)

National Institutes of Health. Biomedical Ocean Nutrition Information and Technological Application (BONITA) H. Rutherford, PI, D Fries, & J. Sleasman CO–I 1, 236, 360. Partners with Pier Aquarium , Lakewood Elementary school and College of Marine Science, COSEE Florida and College of Education at USF. (not funded)

National Science Foundation Geosciences Division. Sea Trek Distance Learning: A Pilot Project to Link the Geosciences, Education and Tomorrow’s Teachers. Submitted by MOTE Marine Laboratory, D. Nieburh.

Protecting Environmental Assets through Research and Leisure (PEARL) Project
A MERHAB005 focused Proposal \$2,174,812

PI’s: Frank Muller–Karger, Chuanmin Hu, Kendall Carder Remy Leurssen? Not funded
2005

Learning: A Pilot Project to Link the Geosciences, Education and Tomorrow’s Teachers.
Submitted by MOTE Marine Laboratory, D. Nieburh PI, B. Spector Consultant (not funded)

National Science Foundation Information Technology Experiences for Students and Teachers Program. Remote Science Technology Training Program. Submitted by USF College of Marine Science. D. Fries PI, CO–I’s FM Karger, H. Botterbusch, Sub Contractor, B. Spector. \$1, 450, 881 (recommended for revision and resubmission)

Environmental Literacy 2005: The LEGO AUV–teaching NOAA science with engineering– Dr. Rogers Tufts University to NOAA.

Science on a Sphere at MOSI – Museum of Science & Industry Foundation, Inc. to NOAA

Environmental Literacy 2005: A Unique Partnership to Promote National Ocean Literacy” – COSEE Central Coordinating Office to NOAA

Web Based Inquiry for Environmental Literacy–Dr. Bodzin, Lehigh University to NOAA

The Florida Aquarium’s proposal to the Institute of Museum and Library Service in 2006

The Pier Aquarium’s proposal to the Institute of Museum and Library Service in 2006

COSEE Southeast

Proposal Assistance

COSEE SE presented information about the NSF Criterion II on Broader Impacts in regional universities. One hour Friday Faculty/Graduate Student seminars were held at Savannah State University, University of Georgia, Skidaway Institute of Oceanography, North Carolina State University and University of South Carolina. (Approximately 60 scientists)

COSEE SE continues to refine and enhance online information for scientists on outreach:
Scientists Niche: www.cosee-se.org

COSEE SE conducted a regional survey to establish benchmarks on how scientists addressed broader impacts and were engaged in outreach: Scientist Survey and Online Published Results: www.cosee-se.org (N=108 regional scientists)

Broader Impacts NSF Collaborations

Clark Alexander, SkIO
Savannah, New Zealand

NSF OCE0646771 Collaborative Research: Late Quaternary Framework of the Waipaoa Continental Margin: Quantifying Mass Fluxes and Event Stratigraphy for Integrated Source-to-Sink Studies

Two educators participated on cruises, worked in the laboratory, presented at meetings, developed lessons and presentations on the COSEE SE websites

Carrie Thomas NCSU

Raleigh, Gulf of Mexico

NSF OCE 0726271 Benthic Dinoflagellate Migration (BenDiM): Occurrence and Processes
Daniel Kamykowski dan_kamykowski@ncsu.edu (Principal Investigator), John Morrison (Co-Principal Investigator), Gerald Janowitz (Co-Principal Investigator), Carrie Thomas (Co-Principal Investigator)

David DeMaster NCSU Principal Investigator

Carrie Thomas NCSU Co-Principal Investigator

Craig Smith UH Principal Investigator

0636773 (NCSU) and 0636806 (UH) Collaborative Research: Benthic Faunal Feeding Dynamics on the Antarctic Shelf and the Effects of Global Climate Change on Benthic-Pelagic Coupling

Educators were engaged regionally through a BLOG with the investigators.

William Savage, SkIO

SAB, Savannah

NSF OS

Four Educators worked on research lab with Savage and in local cruises. They developed a presentation on their engagement.

Liz Mann, UGA
Savannah
NSF OCE

0929203 Collaborative Research: Iron limitation, carbon metabolism and siderophore production in marine bacteria – a systems biology approach Elizabeth Mann (Principal Investigator)

One educator from SC when on cruises off Mexico and California. Later she worked in the UGA works. She made conference presentations and used information with her marine science class.

Carol Pride, SSU
Savannah
NSF GK-12

Two COSEE SE team members presented to the SSU graduate students on learning strategies for various age groups.

Brian Hopkinson, UGA
Athens
NSF- Emerging Frontiers

1041034 Collaborative Research: Ocean Acidification–Category 1: Effects of pCO₂ and pH on Photosynthesis, Respiration and Growth in Marine Phytoplankton Brian Hopkinson (Principal Investigator)
Funded

Jack Blanton, SkIO
Savannah, GA
Unfunded NFS

Direct Injections of Coastal Waters Across the Continental Shelf of southeastern United States.

Dana Savidge, Jack Blanton, Harvey Seim, John Bane and Jim Nelson
SkIO, UNC-CH
Savannah and Chapel Hill
Unfunded NSF

Continental Shelf Circulation related to the Gulf Stream and coastal currents

Alexander Dean, T. Wolcott, Mihail L. Sichertiu, Judy Wink, Vicki Paulas NCSU
Raleigh
Unfunded NSF

CPS Medium Rapid Prototyping of underwater network of embedded systems for a low cost marine environmental sensor network.

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Samatha Joye UGA
Athens
Unfunded NSF
Gulf of Mexico Microbial Observatory

Steve Ross, UNC W
Dr. Craig Young (Univ. of Oregon); John Bane, UNC-CH, Cheryl Morrison, USGS
Wilmington
NSF PIRE 09505
In Progress

Proposal Collaboration — non NSF

Leslie Sautter, CofC
Charleston
NOAA Transect Funded

Joel J. Mintzes, UNC-Wilmington
NOAA Environmental Literacy Unfunded

Denise Sanger
HML and SCSGC
NOAA Coastal Hypoxia Research Program Unfunded

Scientists Engaged with COSEE SE

COSEE SE has engaged scientists in all facets of its activities. One third of the 30+person Board of Advisors has research and/or science responsibilities. These scientists provide COSEE SE team members with introductions to other scientists and also provide review of COSEE SE's engagement strategies. In each of the professional development programs conducted from 2003–2010, COSEE SE has engaged scientists in planning, reviewing materials, presentations and in follow up activities.

Over a hundred scientists from regional universities and state/federal research agencies have participated in COSEE SE functions—UNC W, UNC CH, NCSU, ECU, ECSU, Duke, Cape Fear Technical College, NC DENR—Marine Fisheries, NOAA Lab-Beaufort, NOAA Coastal Reserves; USC, Clemson, College of Charleston, USC Beaufort, Coastal Carolina University, SC DNR-MRRI, SCDHEC/OCRM, NOAA HML, NOAA CSC, NOAA NERRS; UGA, SkIO, UGA MAREX, Georgia Tech, West Georgia University, NOAA NERRS and Grays Reef NMS. COSEE SE has been involved with over 20 research scientists in Florida through the SECOORA program. COSEE SE has worked with scientists at VIMS and University of Maryland.

COSEE Ocean Learning Communities

COSEE–OLC Proposal Support

G. Rocap – UW Oceanography faculty – July 2006

Researcher sought consultation for an NSF CAREER proposal, an undergraduate course and collaboration on genomics outreach for underrepresented groups. The proposal was funded.

A. Babson – UW Oceanography grad student – July 2006

The researcher sought consultation for design of an outreach project for the Inside Passage kayak trip, and requested review of a proposal for a private foundation.

J. Delaney – UW Oceanography faculty – August, 2006

The researcher sought support in preparation of the OOI–NEPTUNE Educational workshop, and requested attendance at this workshop.

G. Armbrust – UW Oceanography faculty – December 2006

The researcher sought proposal assistance for the NST IRES Program. This proposal was funded in January 2007.

K. Edwards – UW Applied Physics Lab post–doc – January 2007

The researcher sought consultation, design assistance, and review of the criterion 2 section of an NSF proposal. This proposal was funded in Jan. 2007.

D. Kelley – UW Oceanography faculty – March 2007

The researcher sought a referral for evaluation personnel for an NSF IGERT proposal. This proposal was funded.

Ken Sebens – UW Friday Harbor Labs director and Biology faculty – April 2007

Danny Grünbaum – UW Oceanography faculty – April 2007

David Armstrong – UW Fisheries faculty – April 2007

The researchers sought assistance in preparing an NSF GK–12 proposal. Support was provided in program design, organization of PI working sessions, and review of proposal. This proposal was funded in Dec 2007 and members of COSEE–OLC continue to serve on the external advisory committee for this program.

Julie Huber. – WHOI research professor – July 2007

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Researcher sought consultation for teacher research work on a research cruise for an NSF proposal criterion 2, and review of the criterion 2 section of the proposal. This proposal was funded.

K. Edwards – UW Applied Physics Lab post-doc – July 2007

Researcher sought consultation, assistance with design, and review of the criterion 2 section of an NSF proposal. This proposal was funded.

M. Tivey – WHOI research professor, July 2007

A. Thorrold – WHOI COSEE Coordinator – July 2007

Researchers sought assistance with preparation of an NSF proposal including professional development for teachers. COSEE-OLC provided consultation, design assistance and review of criterion 2 section of this proposal. This proposal was funded.

Paul Johnson – UW Oceanography research professor – August 2007

Researcher sought consultation, design assistance, and review of criterion 2 section of an NSF proposal. This proposal was funded.

M. Miller – Exploratorium project director – August 2007

Researcher sought consultation, design assistance, and review of the criterion 2 section of an NSF proposal for the Blueprint for Cyberinfrastructure Project. This proposal was not funded, but was later resubmitted.

G. Muller-Parker – Western Washington Univ. professor – Sept 2007

Researcher sought consultation on potential collaboration with COSEE-OLC for March 2008 NSF call.

A. Ogston – UW Oceanography faculty – Oct 2007

Researcher sought preliminary consultation on possible education and outreach activities for an August 2008 NSF proposal, including development of a suite of potential ideas for local collaboration with the Seattle Art Museum.

C. Krembs – UW Applied Physics Lab, Assistant Professor – Oct 2007

Researcher sought consultation, design assistance, and review of the criterion 2 section of an NSF proposal. This proposal was funded.

P. Johnson – UW Oceanography professor – Nov 2007

Researcher sought consultation on Criterion II for his NSF proposal.

P. Johnson – UW Oceanography professor – Nov 2007

Researcher sought support in development of an education activity for NSF proposal and connection with project collaborators at RIDGE 2000 office.

F. Stahr – Ocean Inquiry Project director – Jan–March, 2008

Researcher sought collaboration for new COSEE–OLC collaborative NSF proposal. This proposal was funded and OIP continues to collaborate with COSEE–OLC.

S. Remington – UW Oceanography graduate student – March 2008

Researcher sought consultation about preparing an NSF proposal including linking North Seattle Community College with ocean research at UW.

D. Beauchamp – UW School of Aquatic and Fishery Sciences faculty – May 2009

K. Holsman – UW School of Aquatic and Fishery Sciences post–doc – May 2009

E. Duffy – UW School of Aquatic and Fishery Sciences post–doc – May 2009

Researchers sought consultation on the broader impacts component of a Washington Sea Grant proposal, This proposal was not funded, the researchers have sought COSEE–OLC consultation on future proposals.

J. Keister – UW Oceanography faculty – May 2009

M. Brett – UW Engineering faculty – May 2009

Researchers sought consultation on the broader impacts component of a Washington Sea Grant proposal, This proposal was not funded, the researchers have sought COSEE–OLC consultation on future proposals.

G. VanBlaricom – UW School of Aquatic and Fishery Sciences faculty – May 2009

D. Beauchamp– UW School of Aquatic and Fishery Sciences faculty – May 2009

P.S. McDonald – UW School of Aquatic and Fishery Sciences post–doc – May 2009

Researchers sought consultation on the broader impacts component of a Washington Sea Grant proposal. This proposal was not funded, the researchers have sought COSEE–OLC consultation on future proposals.

J. Ruesink – UW Biology faculty – February 2010

S. Yang – UW Biology graduate student – February 2010

The researchers sought consultation on the broader impacts component of a proposal to NSF. This proposal was not funded; the researchers sought continued support from COSEE–OLC when the proposal was resubmitted. The outcome of the re–submittal is not yet known.

D. Beauchamp – UW School of Aquatic and Fishery Sciences faculty – March 2010.
J. Keister – UW Oceanography faculty – March 2010
M. Brett – UW Engineering faculty – March 2010
T. Quinn – UW School of Aquatic and Fishery Sciences faculty – March 2010

The researchers sought consultation on the broader impacts component of a proposal to the EPA. The outcome of this proposal is not yet known.

G. VanBlaricom – UW School of Aquatic and Fishery Sciences faculty – May 2010
D. Beauchamp – UW School of Aquatic and Fishery Sciences faculty – May 2010
P.S. McDonald – UW School of Aquatic and Fishery Sciences post-doc – May 2010

The researchers sought consultation on the broader impacts component of a proposal to WA Sea Grant/NOAA. This proposal was not funded.

Luc Rainville – UW Applied Physics Laboratory faculty – August 2010
Craig Lee – UW Applied Physics Laboratory faculty – August 2010
Glenn Carter – University of Hawaii Oceanography faculty – August 2010

The researchers sought consultation on the broader impacts component of a proposal to NSF. The outcome of this proposal is not yet known.

Broader Impacts Opportunities/Support Provided To Researchers By COSEE-OLC (Not Proposal Submissions)

C. Peach – Scripps Co-PI COSEE-CA – Oct 2006

COSEE-OLC connected C. Peach with D Kelley at UW, who works with the NEPTUNE group, for OOI cyberinfrastructure education planning.

J. Deming – UW Oceanography faculty – March 2007

The researchers sought assistance, support, and selection advice for high school participation in IYP cruise.

R. Rupan – UW Oceanography engineer – April 2007

The researcher sought assistance connecting with local education institutions interested in ROVs and gliders.

M. Bertram – UW Oceanography and Program on Climate Change coordinator – April 2007

COSEE-OLC provided consultation to help the UW Program on Climate Change (PCC) formalize school visits by PCC scientists. The PCC continues to have a very active K-12 outreach program.

Z. Szuts – UW Oceanography and Applied Physics Lab grad student – April 2007

COSEE–OLC assisted this researcher by providing advising and connections to labs in France while the researcher was seeking Post Doctoral positions.

K. Hoffman – UW School of Marine Affairs grad student – April 2007

Researchers sought assistance with educational project for MS degree studying effect of a virtual tool in 8th grade classrooms.

E. Rehm – UW Oceanography grad student – June 2007

Researcher sought assistance for education ideas for presentation to Board members of Salish Seas, a local boat–based education program. This researcher later participated in multiple COSEE–OLC events aimed at connecting researchers and their science with citizens who volunteer around the marine environment.

R. Wood – UW Atmospheric Sciences, professor – July 2007

Researchers sought consultation and assistance with development of ideas for education activities for the NSF funded VOCALS project.

W. Wilcock – UW Oceanography professor – August 2007

COSEE–OLC provided assistance connecting Washington science teachers to NEPTUNE research cruise work and website.

J. Delaney – UW Oceanography professor – August 2007

D. Kelley – UW Oceanography professor – August 2007

C. Peach, – Scripps Co–PI COSEE–CA – August 2007

Assisted with preparation and presentation of education activities for the OOI–RCO education plan at Ocean Leadership/NSF OOI meeting.

G. Armbrust – UW Oceanography professor – Aug 2007

Researcher sought assistance with preparation of graduate student application and program announcement for the NSF – IRES program.

H. Price – UW Program on Climate Change – Nov 2007

Researcher sought review of Climate Quest course syllabus and content. Climate Course is a course for high school students developed at UW around climate change issues.

B. Love – UW Oceanography grad student – Oct 2007

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Researcher sought assistance in developing connections for interviews for post doc positions in Washington State Universities. Love is currently an assistant professor at Western Washington University.

K. Chan – UW Oceanography graduate student – October 2007

L. Slemons – UW Oceanography graduate student – October 2007

Researchers were recruited by COSEE–OLC to contribute in Family Science Weekend at the Seattle Aquarium.

R. Rupan, UW Applied Physics Lab engineer – October 2007

Researchers sought assistance in developing a plan for an “Adopt–a–Float” project.

K. Chan – UW Oceanography graduate student – November 2007.

COSEE OLC provided support for this researchers work helping high school students mentor elementary students in marine sciences.

L. Thompson, UW Oceanography professor – December 2007

H. Price, UW Applied Physics Laboratory professor – December 2007

Researchers sought a second review of the Climate Quest course syllabus and content. Climate Course is a course for high school students developed at UW around climate change issues.

T. Clay – UW Oceanography graduate student – January 2008

Researcher sought support in helping high school students mentor and teach marine sciences to elementary students. Tansy Clay is now working with COSEE–OLC.

J. Deming – UW Oceanography professor – February 2008

COSEE–OLC assisted in recruiting and supported the participation of one high school student and one marine science 12th grade teacher in IPY in the Arctic.

T. Moon, UW Earth and Space Sciences graduate student – February 2008

Researcher sought consultation and advising on E&O for education job in Big Sky, Montana.

T. Beba, UW Oceanography undergraduate student – February 2008

Researcher sought support for writing an article on the COSEE mission, COSEE–OLC, and COSEE partnerships for the Northwest Science and Technology Magazine.

A. Ingalls, UW Oceanography Ass. Prof. – March 2008

Researcher sought advice about lab design for renewing a course on chem., boil, geol, and phys oceanography.

K. Genther – UW Oceanography staff – March 2008

Researcher sought assistance with development of graduate school project with an education focus for graduate school applications. Ms. Genther is currently working toward her masters degree in the school of forest resources, focusing on a project that includes an education emphasis.

K. Chan – UW Oceanography graduate student – March 2008

L. Tobin – UW Oceanography graduate student – March 2008

Researchers sought support for developing activities to present their research at 2 days of “Marine Exploration Mania”, a public event held at the Pacific Science Center in Seattle.

November 2009

N. Ahlgren – UW Microbiology, post doc

E. Aitken – Olympic College, science undergraduate

C. Anderson – UW oceanography, undergraduate

M. Bertram – UW oceanography, program on climate change coordinator

J. Colangelo–Lillis – UW Oceanography, Graduate Student

A. Djunaedi – UW Oceanography, undergraduate student

N. Elder, USGS – USGS–Marrowstone Marine Station, fisheries biologist

A. Fassbender – UW Oceanography, graduate student

K. Feifel – UW Oceanography, graduate student

K. Genther – UW School of Marine Affairs, graduate student

A. Hacking – UW Oceanography, undergraduate student

C. Harbitz – UW Oceanography, graduate student

A. Ingalls – UW Oceanography, professor

A. Jefferies – Pacific Biodiversity Institute, secretary of the board

R. Keil, UW Oceanography, professor

B. Kimball – UW Oceanography, lab technician

K. O'Connell – People for Puget Sound, restoration ecologist

M. Melnychuk – UW School of Aquatic and Fisheries Science, research scientist/engineer

A. Myers–Pigg – UW Oceanography, undergraduate student

M. Nuwer – UW Oceanography, lecturer

D. Purce – Washington State Department of Ecology

E. Tobin – UW Oceanography graduate student

E. Weidner – UW Oceanography undergraduate student

W. Wilcock – UW Oceanography, professor and associate director

COSEE–OLC provided researchers opportunity to explore and participate in the Seattle Aquarium’s annual “Family Science Weekend” as a venue for future broader impacts work.

COSEE–OLC also hosted multiple activities at this event providing examples of relevant ocean science activities.

January 5, 2010

- A. Djunaedi – UW Oceanography undergraduate student
- A. Fassbender – UW Oceanography graduate student
- A. Rogers – UW Oceanography graduate student
- C. Kellogg – UW Oceanography graduate student
- E. Tobin – UW Oceanography graduate student
- J. Colangelo–Lillis – UW Oceanography graduate student
- J. Kellogg – UW Oceanography graduate student
- J. Koester – UW Oceanography graduate student
- K. Chan – UW Oceanography graduate student
- K. Feifel – UW Oceanography and School of Marine Affairs graduate student
- L. Slemmons – UW Oceanography graduate student
- M. Kerr–Riess – UW Oceanography graduate student
- S. Heerhartz – UW Oceanography graduate student
- S. Zhang – UW Oceanography graduate student
- A. Bruner – UW School of Aquatic and Fisheries Sciences graduate student
- K. Forsgren – UW School of Aquatic and Fisheries Sciences graduate student
- M. Goff – UW School of Aquatic and Fisheries Sciences graduate student
- N. Kendall – UW School of Aquatic and Fisheries Sciences graduate student
- R. Arnold– UW School of Aquatic and Fisheries Sciences graduate student
- C. Combest–Friedman – UW School of Marine Affairs graduate student
- C. Gonzalez – UW School of Marine Affairs graduate student
- G. Glaub – UW School of Marine Affairs graduate student
- K. Genthner – UW School of Marine Affairs graduate student
- K. Schleit – UW School of Marine Affairs graduate student
- M. Massaua – UW School of Marine Affairs graduate student
- N. Wehner – UW School of Marine Affairs graduate student
- N. Woodward – UW School of Marine Affairs graduate student
- P. Barrett – UW School of Marine Affairs graduate student
- A. Caracol – UW Molecular and Cellular Biology graduate student
- T. Delgado – UW Microbiology graduate student
- J. Ramos – UW College of Forestry Landscape Ecology and Conservation graduate student
- T. Clay – UW Oceanography, post doc
- W. Smith – UW Department of Environmental and Occupational Health Sciences, post doc
- A. Devol – UW Oceanography, academic research scientist
- A. Duxbury – UW School of Oceanography, research scientist. Retired
- A. Ingalls – UW Oceanography, academic research scientist
- B. Kimball – UW Oceanography, academic research scientist
- E. Mayorga – UW Oceanography, academic research scientist
- F. Stahr– – UW Oceanography, academic research scientist
- J. Keister– UW Oceanography, academic research scientist
- J. Murray – UW Oceanography, academic research scientist
- M. Dethier – UW Oceanography, academic research scientist

R. Shuman – UW Oceanography, academic research scientist
 W. Wilcock – UW Oceanography, academic research scientist
 I. Jimenez – UW School of Aquatic and Fisheries Sciences, academic research scientist
 J. Seeb – UW School of Aquatic and Fishery Sciences, academic research scientist
 J. Est – UW School of Aquatic and Fishery Sciences, academic research scientist
 L. Hauser – UW School of Aquatic and Fisheries Sciences, academic research scientist
 M. Hansen – UW School of Aquatic and Fisheries Sciences, academic research scientist
 L. Seeb – UW School of Aquatic and Fishery Sciences, academic research scientist
 M. Melnychuk – UW School of Aquatic and Fisheries Sciences, academic research scientist
 R. Rupan – UW School of Aquatic and Fishery Sciences, academic research scientist
 A. Ivakin – UW Applied Physics Lab, academic research scientist
 M. Selvakumar – UW Applied Physics Lab, academic research scientist
 A. Trimble – UW Biology, academic research scientist
 J. Alberts – UW Biology, academic research scientist
 A.C. Duxbury – North Seattle Community College, academic research scientist, retired
 M. Munn – UW Genome Sciences, academic research scientist
 J. Thomson – WWU Shannon Point Marine Center, academic research scientist
 R. Waters – UW Sea Grant, academic research scientist
 D. Chi – UW Dental Public Health, academic research scientist
 A. Zerbini – NOAA NWFSC, agency research scientist
 C. Kuhn – NOAA, National Marine Mammal Lab, agency research scientist
 C. Shavey – NOAA Fisheries, agency research scientist
 G. Lange – NOAA, agency research scientist
 J. Conner – NOAA–AFSC, agency research scientist
 J. Hempelmann–Halos – National Marine Fisheries Service, NOAA, agency research scientist
 K. O'Connell – People For Puget Sound
 K. Reuland – NOAA NWFSC, agency research scientist
 M. Lander – National Marine Fisheries Service, NOAA, agency research scientist
 S. Nance – NOAA NWFSC, agency research scientist
 K. Neely – National Marine Fisheries Service, NOAA, agency research scientist
 O. Johnson – NOAA Fisheries, agency research scientist
 S. Schmidtko – NRC Research Associate hosted at NOAA–PMEL, agency research scientist
 V. Robigou – ocean scientist, scientific illustrator

COSEE–OLC provided researchers an opportunity to attend a keynote speech by Bruce Alberts on science education and outreach. For scientists, the most significant outcome from the event was Alberts' admonition to scientists to spend 5% of their time doing education and outreach. This event included time for attendees to mingle and make connections with other in attendance, providing connection to others interested in broader impacts issues.

January 6, 2010

A. Gray – UW Oceanography and Applied Physics Lab graduate student
 A. Rogers – UW Oceanography graduate student
 C. Kellogg – UW Oceanography graduate student
 J. Colangelo–Lillis – UW Oceanography graduate student
 J. Kellogg – UW Oceanography graduate student

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J. Koester – UW Oceanography graduate student
L. Slemmons – UW Oceanography graduate student
M. Kerr–Riess – UW Oceanography graduate student
S. Bender – UW Oceanography graduate student
A. Bruner – UW School of Aquatic and Fisheries Sciences graduate student
N. Kendall – UW School of Aquatic and Fisheries Sciences graduate student
G. Glaub – UW School of Marine Affairs, graduate student
K. Genther – UW School of Marine Affairs, graduate student
M. Massaua – UW School of Marine Affairs, graduate student
N. Wehner – UW School of Marine Affairs, graduate student
A. Caracol – UW Molecular and Cellular Biology, graduate student
J. Eggers – UW Applied Physics Lab, graduate student
T. Delgado – UW Microbiology, graduate student
T. Clay – UW Oceanography, post doc
W. Smith – UW Department of Environmental and Occupational Health Sciences, post doc
A. Devol – UW School of Oceanography, academic research scientist
A. Duxbury – UW Oceanography Retired, academic research scientist, Faculty
A. Ingalls – UW Oceanography, academic research scientist
B. Kimball – UW Oceanography, academic research scientist
E. Mayorga – UW Oceanography, academic research scientist
F. Stahr – UW Oceanography, academic research scientist
J. Keister – UW Oceanography, academic research scientist
J. Neibauer – UW School of Oceanography, academic research scientist
K. Jenkins – UW Oceanography, academic research scientist
S. Emerson – UW Oceanography, academic research scientist
H. Galindo – UW School of Aquatic and Fisheries Sciences, academic research scientist
I. Jimenez – UW School of Aquatic and Fisheries Sciences, academic research scientist
J. Seeb – UW School of Aquatic and Fishery Sciences, academic research scientist
L. Hauser – UW School of Aquatic and Fisheries Sciences, academic research scientist
L. Seeb – UW School of Aquatic and Fishery Sciences, academic research scientist
A. Ivakin – UW Applied Physics Lab, academic research scientist
B. Bennett – UW Applied Physics Lab, academic research scientist
D. Jones – UW Applied Physics Lab, academic research scientist
L. Burman – UW Applied Physics Lab, academic research scientist
L. Russell – UW Applied Physics Lab, academic research scientist
M. Selvakumar – UW Applied Physics Lab & Pacific Science Center, academic research scientist
R. Lindsay – UW Applied Physics Lab, academic research scientist
B. Nelson – UW Earth and Space Sciences, academic research scientist
S. Lyman – UW Bothell Science and Technology Program, academic research scientist
M. Munn – UW Genome Sciences, academic research scientist
R. Waters – UW Sea Grant, academic research scientist
S. Schmidtko – NOAA PMEL, agency research scientist
W. Hansen – Pacific Science Center

COSEE–OLC hosted a daylong workshop on broader impacts work that targeted UW scientists. Several sessions were run concurrently allowing researchers to attend those sessions most

relevant to them. A majority of attendees cited that this event enhanced their thinking about broader impacts, and voiced interest in similar events in the future. A post event survey indicated that 98% of the scientists wanted more programs like the one they attended. The same survey indicated that for four of five BI categories, nearly half the participants had no involvement. A follow up survey of participants (planned for Autumn 2010) will help illuminate the impact of the event. One attendee (Jen Ruesink) sought consultation on the broader impacts portion of a NSF proposal immediately following this event.

April 2009

- C. Kellogg – UW Oceanography graduate student
- J. Kellogg – UW Oceanography graduate student
- M. Chadsey – UW School of Marine Affairs
- A. Bruner – UW School of Aquatic and Fisheries Sciences graduate student
- R. Stevens – UW Educational Psychology faculty
- E. Collins – UW Oceanography graduate student
- M. Dalton – UW Education graduate student
- S. Walters – UW Forest Resources research scientist
- J. Masura – UW Bothell Environmental Science lecturer
- A. Jefferies – Pacific Biodiversity Institute, research scientist
- B. Semmens – Reef Environment, research scientist
- D. Purce – Department of Ecology, scientist
- S. Wyllie-Echeverria – Friday Harbor Labs, research scientist
- A. Kveven – Ocean Research College Academy, Everett Community College, research scientist

COSEE-OLC hosted an event focused on “Exploring the Spectrum of Citizen Science”, researchers and citizens participated in this event. Researchers gained perspective on what types of research is being done with citizen science, what citizen groups are eager to participate, what some of the issues with citizen science are, and how to navigate around these issues.

- E. Collins – UW Oceanography graduate student – Spring 2007
- K. Genter – UW Oceanography staff – Spring 2007
- L. Tobin – UW Oceanography graduate student – Spring 2007
- K. Chan – UW Oceanography graduate student – Spring 2007
- J. Kellogg – UW Oceanography graduate student – Spring 2007
- E. Ellis – UW Oceanography graduate student – Spring 2007
- M. Lin – UW Oceanography graduate student – Spring 2007
- C. Kellogg – UW Oceanography graduate student – Spring 2007

- A. Cash – UW Oceanography graduate student – Spring 2008
- C. Durkin – UW Oceanography graduate student – Spring 2008
- L. Slemmons – UW Oceanography graduate student – Spring 2008
- R. McKay – UW Oceanography undergraduate student – Spring 2008
- M. Wiggin – UW Oceanography undergraduate student – Spring 2008

- C. Stover – UW Biology graduate student – Spring 2009
- H. Thibault – UW Biology undergraduate student – Spring 2009

K. Jung – Earth and Space Sciences undergraduate student – Spring 2009
N. Ward – UW Oceanography graduate student – Spring 2009
S. Brody – UW Oceanography graduate student – Spring 2009
T Farnsworth – UW Education graduate student –Spring 2009
H. Cole – UW Oceanography undergraduate student –Spring 2009
H. Gibbs – UW School of Marine Affairs graduate student –Spring 2009

S. Albin – UW School of Aquatic and Fishery Sciences undergraduate student – Spring 2010
T. Durboraw – UW School of Aquatic and Fishery Sciences undergraduate student – Spring 2010
A. Elliot – UW Education graduate student – Spring 2010
V. Engel – UW Oceanography graduate students – Spring 2010
L. Harding – UW School of Aquatic and Fishery Sciences graduate student – Spring 2010
R. Jablonski–Diehl – UW School of Marine Affairs graduate student – Spring 2010
S. Kaur – UW Biology undergraduate student – Spring 2010
W. Neugebauer – UW School of Marine Affairs graduate student – Spring 2010
C. Pew – UW Earth and Space Sciences graduate student – Spring 2010
A. Prentice – UW Geology graduate student – Spring 2010
N. Woodward – UW School of Marine Affairs – Spring 2010

Students in the UW ‘Communicating Ocean Science’ course gain improved understanding of how people learn, and experience doing outreach in a K–5 or informal setting. Course participants have participated in other broader impacts activities upon completion of the course. Course participants report that after participation in the course their advisors request their contribution in preparing the broader impacts portion of research proposals.

C. Pew – UW Earth and Space Sciences graduate student – May 2010

Researcher sought consultation and advice on a capstone project focused on developing high school level curricular materials focused on climate change. COSEE–OLC is providing guidance on this project. This work is ongoing.

Communicating Ocean & Marine Science, November 2008:

A. Belcher – UW Oceanography, undergraduate student
S. Bender – UW Oceanography, graduate student
C. Biladeau – UW Oceanography, undergraduate student
B. Brenner – King County, scientist
A. Bruner – UW School of Aquatic and Fisheries Science, graduate student
A. Cash – UW Oceanography, graduate student
H. Cole – UW Oceanography, undergraduate student
E. Collins – UW Oceanography, graduate student
T. Connolly – UW Oceanography, graduate student
A. Cecilia Peralta Ferriz – UW Oceanography, graduate student
P. Dinnel – WWU and Skagit Marine Resources Committee, scientist
H. Galindo – UW School of Aquatic and Fisheries Science, Post–doc

M. Goff – UW Fisheries, graduate student
 R. Herwig – UW School of Aquatic and Fisheries Science, professor
 F. Hughe – retired scientist
 K. Ludwig – Pacific Science Center, project manager
 J. Neibauer – UW Oceanography, technician
 E. Rehm – UW Oceanography, graduate student
 A. Rogers – UW Oceanography, graduate student
 K. Shamberger – UW Oceanography, graduate student
 L. Singh – UW Oceanography, undergraduate student
 K. Strauss – UW Fisheries, graduate student
 E. Tobin – UW Oceanography, graduate student
 K. Tyson – UW College of the Environment, graduate student
 S. Veirs – BeamReach School, president
 S. Zhang – UW Oceanography, graduate student
 R. Herwig – UW Fisheries, professor
 M. Goff – UW Fisheries, graduate student
 F. Stahr – UW Oceanography, seaglider fabrication center manager
 G. VanBlaricom – UW School of Aquatic and Fisheries Science, professor

Celebrating Summer and Ocean Sciences: August 2009:

J. Adams – Washington Sea Grant, marine water quality specialist
 N. Ahlgren – UW Microbiology, post-doc
 C. Anderson – UW Oceanography, undergraduate student
 P. Barrett – UW Oceanography, graduate student
 M. Bridoux – UW Oceanography, post-doc
 A. Bruner – UW School of Aquatic and Fisheries Science, graduate student
 A. Cash – UW Oceanography, graduate student
 J. Colangelo-Lillis – UW Oceanography, graduate student
 J. Cordell – UW School of Aquatic and Fisheries Science, research scientist
 L. Crosson – UW School of Aquatic and Fisheries Science, laboratory technician
 N. Elder – USGS Marrowstone Marine Station, fisheries biologist
 A. Fassbender – UW Oceanography, graduate student
 K. Feifel – UW Oceanography, graduate student
 H. Galindo – UW School of Aquatic and Fisheries Science, post-doc
 D. Gomez-Uchida – UW School of Aquatic and Fisheries Science, graduate student
 A. Hacking – UW Oceanography, undergraduate student
 L. Hanson – UW Oceanography, Undergraduate student
 S. Heerhartz – UW School of Aquatic and Fisheries Science, graduate student
 A. Ingalls – UW Oceanography, faculty
 A. Jefferies – Pacific Biodiversity Institute, secretary of the board
 C. Kellogg – UW Oceanography, graduate student
 J. Kellogg – UW Oceanography, graduate student
 R. Lipsy – UW Oceanography, undergraduate student
 M. Melnychuk – UW SAFS, research scientist
 K. Mork – Western Washington University, graduate student

R. Morris – UW Oceanography, faculty
A. Myers–Pigg – UW Oceanography, undergraduate student
J. Neibauer – UW Oceanography, lab technician
W. Neugebauer – UW School of Marine Affairs, graduate student
K. O'Connell – People for Puget Sound, restoration ecologist
D. Purce – Washington State Department of Ecology
A. Rammer – WDFW, retired
M. Roed – Western Washington University Huxley College, graduate student
C. Sabine – NOAA, research scientist
J. Sachs – UW, Oceanography, professor
K. See – UW Quantitative Ecology and Resource Management, graduate student
L. Slemmons – UW Oceanography, graduate student
B. Stevick – UW School of Aquatic and Fisheries Science, graduate student
D. Sutherland – UW Oceanography, post–doc
E. Tobin – UW Oceanography, grad student
J. Urton – UW Biology graduate student
S. Wyllie–Echeverria – UW Friday Harbor, Labs research scientist
E. Weidner – UW Oceanography, undergraduate student
W. Wilcock – UW Oceanography, professor and associate director

COSEE–OLC regularly hosts events where researchers are invited to share a poster about their research with an audience composed primarily of adults who volunteer in the marine environment. Researchers who are not interested in presenting their work are also invited to attend the events, mingle with marine volunteers, and experience first–hand other scientists sharing their research with the public. Evaluation indicates that through their participation in these events researchers have strengthened their ability to communicate about their research with a broad public and with other scientists, have gained new perspectives and ideas about future research, and benefits from interacting with other researchers who participate in these events. Most researchers return to participate in subsequent events.

Sound Conversations: May 2010:

J. Anderson – UW School of Oceanography, graduate student
P. Bell – UW College of Education, associate professor, learning sciences
M. Bridoux – UW School of Oceanography, post doc
A. Bruner – UW School of Aquatic and Fisheries Science, graduate student
T. Clay – UW School of Oceanography, post doc COSEE–OLC
A. Djunaedi – UW School of Oceanography, undergraduate student
C. Edmonds – UW School of Oceanography, undergraduate student
E. Ellis – UW School of Oceanography, graduate student
K. Genter – UW School of Marine Affairs, graduate student
G. Glaub – UW School of Marine Affairs, graduate student
C. Greengrove – UW Tacoma, faculty
S. Heerhartz – UW School of Aquatic and Fisheries Science, graduate student
C. Kellogg – UW School of Oceanography, graduate student
J. Kellogg – UW School of Oceanography, graduate student

R. Lipsy – UW School of Aquatic and Fisheries Science, graduate student
D. Logen – UW School of Oceanography, undergraduate
I. Muegler – UW School of Oceanography, post doc
A. Myers–Pigg – UW School of Oceanography, undergraduate student
J. Neibauer – UW School of Oceanography, lab technician
K. Newell – UW School of Oceanography, staff
M. Nuwer – UW School of Oceanography, faculty
D. Scipio – UW College of Education, graduate student
S. Stromholt – UW College of Education, graduate student
J. Urton – UW Biology, graduate student

COSEE–OLC was one of the sponsors for the 2010 Sound Conversations speaker series at the Seattle Aquarium. Rick Keil, UW School of Oceanography, Associate Professor was a featured speaker. Other speakers in the series included Philippe Cousteau and Brady Barr.

COSEE Great Lakes

Supporting Scientists to Make Education Presentations

Dr. Elizabeth Hinchey–Malloy [water quality, USEPA] and Dr. Rochelle Sturtevant [aquatic scientist, Great Lakes Environmental Research Laboratory] and Dr. David Lusch [geology, Michigan State].

The scientists were supported by COSEE GL to present a symposium: “Great Lakes Science in a Nutshell” at the Detroit regional meeting of the National Science Teachers Association in October 2006. Audience of nearly 60 educators attended, and many were subsequently selected for participation in COSEE programs where they could learn directly with the scientists.

Dr. David Lusch, Michigan State University

Scientist was supported by COSEE GL to present his research on “Geology of the Great Lakes Basin” at the Detroit regional meeting of the National Science Teachers Association in October 2006. The audience consisted of about 30 teachers who had numerous questions about the topic and teaching methods. Follow up was not attempted.

Dr. Joel Hoffman [USEPA Research Laboratory, Duluth MN]

Dr. Hoffman co–presented with Minnesota teacher Corydon Kolodji on the topic of “COSEE Superior creates passion for science” [Abstract # ED34A–02] at the Ocean Sciences meeting in February 2010.

Of the experience, Dr. Hoffman reported, “I have not previously participated in an Education and Outreach session. If not for our talk, I doubt I would have attended a single Outreach and Education presentation. Yet, because of this professional presentation, I remained in the entire session. More importantly, I enjoyed it. As I heard through the afternoon, science education is about finding common ground between the scientific material and each student's worldview. Perhaps this is intuitive to those with a pedagogical background, but as a scientist, I perceive our work lies within an objective realm, not embedded in the social matrix of a student's life. I found this perspective useful, particularly the realization that a social context may place broad bounds on people's connections to science and at the same time create specific opportunities for communicating science to a public audience.”

Schools for Scientists, 2007 and 2009

At the annual meeting of the International Association for Great Lakes Research in 2007 and 2009, COSEE GL organized training sessions for scientists and graduate students at the meeting. Audience members self–selected to attend components of the programs they wished, or that the conference program would allow. In 2007, names and affiliations of participants were not collected because an anonymous evaluation survey was given. Sessions in 2007 were limited to ½ day, and consisted of presentations by education/outreach professionals on topics of:

How should I prepare for a presentation at a school?

What are those Educational Standards that teachers have to meet?

How can I develop an effective statement of “Broader Impact” for my project?
How can I engage underrepresented groups in my science?
Does writing science for the public have to involve “dumbing it down?”
What level of detail does a decision maker need?
What are funders looking for when they ask for “outreach?”

Following our sessions at IAGLR, the science communication specialists were available to meet with individual researchers to discuss their needs. Comments following the program were summarized in simple survey metrics:

- How much did the presentation(s) increase your awareness of information or resources that will help you with your education or outreach efforts? 61.5% said *Substantially**

- How much did the presentation(s) increase your awareness of how to design or deliver an educational experience? 35% *Moderately*; 46% *Substantially**

- As a result of the School for Scientists: Mark all that apply.*
 - I will develop an education or outreach initiative (10/26)*
 - I will check the COSEE Great Lakes Web site for resources (17/26)*
 - I learned a specific technique that I can use (17/26)*
 - I have a better idea of how to work with underserved groups (11/26)*
 - I want to learn more about how to work with an educator (8/26)*

Additional comments included:

“This was one of the most educational sessions that I have attended.”
“I especially liked the presentations that focused on presenting to younger/non–scientific communities.”
“This session, consistent with its content, should break the mold of the conference. It should have less of a rigid 20–minute presentation format, lots of time for discussion, and possibly for on a half–day before or after the rest of the conference.”
“This was a great session! It was very refreshing and exciting to see so many scientists attending. Keep it up!”

In 2009 the following scientists participated as co–presenters with educators in the School for Scientists:

Dr. William Edwards, Niagara University [veteran of COSEE workshops]
Dr. Russell Cuhel, University of Wisconsin – Milwaukee [COSEE Collaborative]
Dr. Carmen Aguilar, University of Wisconsin – Milwaukee [COSEE Collaborative]
Dr. Jeff Reutter, The Ohio State University [COSEE GL Advisory Committee]
Dr. Sara Adlerstein, University of Michigan [Subsequent recipient of COSEE CA subcontract for COS]
Dr. David Hart, University of Wisconsin – Madison [subsequently teaching course with COSEE Director Fortner]
Dr. Elizabeth Hinchey Malloy, USEPA

Educator House Calls at Science Facilities

The following were venues where scientists engaged for a day of learning with educators who visited their labs to talk about classroom collaborations:

Great Lakes Environmental Research Laboratory, Muskegon MI, 2006

Scientists Fahnenstiel [harmful algal blooms], Pothoven [invasive species], Pangle [invasive species], and Steve Ruberg [real-time coastal observation network] learned from teachers what components of their sciences could meet teaching standards, and how the scientists could become involved with a local school.

The Ohio State University Rural Sociology Department, GK-12 program based on the Sugar Creek Watershed near Wooster OH, 2007

Scientists Drs. Richard Moore [Rural Sociology], Lance Williams [Natural Resources], and Casey Hoy [Agroecosystems] participated in the learning along with their graduate students Debra Hersha, Heather Fair and Keely Davidson-Bennett.

New York State Department of Environmental Conservation's Dunkirk Fisheries Station and Tom Ridge Environmental Center, 2007

Scientists William Culligan, Dr. Ed Masteller, Dr. Jeanette Schnars, and Scott White, Environmental Supervisor from the Erie County (PA) Department of Health. Participating educators emphasized that science is best learned by experiential methods, and hands-on activities are the ones that get students excited about science. Researchers suggested that students visit science facilities such as TREC and the Aquarium of Niagara, and that educators incorporate real-time data and preserved specimens into their teaching to spark that interest in science.

Great Lakes Environmental Research Laboratory, Ann Arbor, MI, 2009

This House Call, in partnership with Eastern Michigan University, focused on having educators provide input on which GLERL data would be useful for classes, and what data formats could be used for school science. Drs. David Schwab [hydrology], Greg Lang [physical limnology, episodic events], George Leshkevich [ice forecasting, water balance], Tom Nalepa [climate change], Hank Vanderploeg [ecology], and Ron Muzzi [electronic databases] from GLERL and Dr. Sandra Rutherford [geology] from EMU subsequently used this information for preparation of lessons: Teaching with Great Lakes Data (www.greatlakeslessons.com).

USEPA Mid-Continent Ecology Division Laboratory in Duluth, Minnesota, 2009

Research scientists from the University of MN –Duluth were Drs. Jay Austin [coastal physical oceanography], Elizabeth Minor [aquatic organic matter], Nigel Wattus [acoustic remote sensing]. From USEPA's Mid-Continent Ecology Division, the following research scientists participated:

Al Olmstead	Current frog toxicology research
Dan Villeneuve	Predictive toxicology
Larry Burkhard	Accumulation of chemicals in fish
Mark Pearson	Great Rivers research
Jo Thompson	Ecological research on the Great Lakes

Many of COSEE GL's opportunities for assisting with Broader Impacts have come from selecting and working with scientists engaged in our teacher professional development programs (two week-long institutes each summer). The researchers are eager to share their work but not always clear what is palatable or useful for education. We work with them individually as needed. Some comments emerging from these experiences include:

"Participating in the COSEE workshop helped me learn my own job better, to help people who weren't experienced with sampling procedures."

"I was very impressed with the knowledge of the teachers at the beginning of the workshop—they were very well chosen."

"Participating in COSEE will help me with presentation preparation. I have many more ideas for communicating ideas and education."

"This program allowed me to make some new networking connections that may help me in my future career....I know I was helpful with answering questions the teachers had about the research we conducted. If I couldn't answer them, I'd help them find somebody who could."

"Participating in COSEE has helped me become better with communication with the public—more awareness of how teachers present science will help me better package science presentations to general audiences."

COSEE Ocean Systems

Since fall 2005, COSEE–OS has helped 21 scientists at 6 institutions to develop "Broader Impacts" plans for their NSF, NOAA and NASA proposals. In addition, COSEE–OS has provided "Broader Impacts" professional development for 41 scientists at 12 institutions and 22 graduate students/post-docs at 5 institutions. This intensive communications training has been largely in the form of developing and presenting concept maps to non-scientists within workshops and at national educator conferences. Descriptions of how COSEE–OS has interacted with scientists are included in the following Highlights documents: "COSEE–Ocean Systems: Building Consensus and Understanding Through Collaboration"; "COSEE–Ocean Systems: Faculty–Graduate Student Collaborative Workshop Model"; "COSEE–Ocean Systems: Transferring Workshops between Centers – Pacific Partnerships"; "COSEE–Ocean Systems: Facilitation of Communication among University of New Hampshire Scientists and the Seacoast Science Center"; "COSEE–Ocean Systems: Impact on Graduate, Undergraduate, and High School Students"; and "COSEE–Ocean Systems: Scientist Participation in Education Conferences and Venues."

PROPOSAL ASSISTANCE

Institutions and PI Scientists are listed below:

Bigelow Laboratory for Ocean Sciences

Joaquim Goes, Mike Sieracki, and Rick Wahle

University of Maine

Ian Bricknell, Fei Chai, Pete Jumars, Lee Karp–Boss, Sara Lindsay, Larry Mayer, Mary Jane Perry, Andrew Pershing, Collin Roesler, Mark Wells, and Huijie Xue

University of New Hampshire

Hui Feng, Tim Moore, Ru Morrison, and Joe Salisbury

Other

Yi Chao (Jet Propulsion Laboratory)
Campbell (Buzz) Scott (OceansWide)
Robert Snyder (Island Institute)

PROFESSIONAL DEVELOPMENT (PD) OF SCIENTISTS

Communications training of science faculty, graduate students, and post-docs

FACULTY (affiliation shown at time of PD training)

#Nikki Adams (California Polytechnic State University at San Luis Obispo)
David Avery (UConn)
Elizabeth Burakowski (UNH)
Janet Campbell (UNH)
*Fei Chai (UMaine)

#Paul Choboter (California Polytechnic State University at San Luis Obispo)
Linda Duguay (USC)
*Hui Feng (UNH)
*David Fields (Bigelow Laboratory for Ocean Sciences)
Peter Girguis (Harvard University)
*Joaquim Goes (Bigelow Laboratory for Ocean Sciences)
Helga do Rosario Gomes (Bigelow Laboratory for Ocean Sciences)
W. Monty Graham (Dauphin Island Sea Lab)
Kjell Gundersen (University of Southern Mississippi)
Tom Huntington (US Geological Survey, Augusta, ME)
Carolyn Jordan (UNH)
*Pete Jumars (UMaine)
Linda Kalnejais (UNH)
*Lee Karp–Boss (UMaine)
*Sara Lindsay (UMaine)
*Larry Mayer (UMaine)
Scott Milroy (University of Southern Mississippi)
#Mark Moline (California Polytechnic State University at San Luis Obispo)
Timothy Moore (UNH)
*Ru Morrison (UNH)
Jim O'Donnell (UConn)
Karen Orcutt (University of Southern Mississippi)
Cheryl Peach (Scripps Institution of Oceanography)
Jon Pennock (UNH)
*Mary Jane Perry (UMaine)
*Andrew Pershing (UMaine)
*Collin Roesler (UMaine)
*Joe Salisbury (UNH)
Annette Schloss (UNH)
Fred Shair (Caltech, retired)
*Michael Sieracki (Bigelow Laboratory for Ocean Sciences)
Ramunas Stepanaukas (Bigelow Laboratory for Ocean Sciences)
#Lars Tomanek (California Polytechnic State University at San Luis Obispo)
Benjamin Twining (Bigelow Laboratory for Ocean Sciences)
Penny Vlahos (UConn)
Michael Whitney (UConn)

GRADUATE STUDENTS/POST-DOCS

Carrie Armbrecht (UMaine)
Susie Arnold (UMaine)
Laura Brothers (UMaine)
Elizabeth Campbell (UMaine)
Ivona Cetinic (UMaine)
Alina Gainusa–Bogdan (UMaine)
Deborah Goodwin (UNH)
Kari Heinonen (UConn)

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Zachary Helm (UMaine)
Mahima Jaini (UMaine)
Phoebe Jeklelek (UMaine)
Keri Lindberg (UMaine)
Chris Manning (UNH)
Marissa McMahan (UMaine)
#Lisa Needles (California Polytechnic State University at San Luis Obispo)
Maria Nielsdottir (University of Southampton)
Artur Palacz (UMaine)
Nicholas Record (UMaine)
Ian Salter (University of Southampton)
Peter Stetson (UMaine)
Kristin Wilson (UMaine)
Ashley Young (UMaine)

*Scientists also named under the "PROPOSAL ASSISTANCE" category
#Collaborative workshop with COSEE–Pacific Partnerships who may also "claim" these individuals

COSEE Alaska

Support Provided To Researchers By COSEE Alaska For Proposal Submissions

2010

Gary Freitag, UAF faculty member and Alaska Sea Grant Marine Advisory Agent, School of Fisheries and Ocean Sciences

A researcher requested assistance during 2009 in the development of K–12 education activities with the North Slope Borough School District as part of the broader impacts of a marine invasive species education project proposal submitted to NASA. The proposal was unsuccessful but was subsequently submitted in 2010 as the outreach component of a research proposal to the National Sea Grant program. The revised proposal was funded, and COSEE staff have continued to act as a liaison between the researcher and the school district, which will be one of COSEE Alaska's primary formal education partners beginning in 2011.

Dr. Rolf Gradinger, UAF faculty member, School of Fisheries and Ocean Sciences

A researcher requested review and a letter of support from COSEE Alaska in a grant proposal for a study of Arctic plankton ecology to the NSF Division of Ocean Sciences, involving three ship-based expeditions into the Pacific Arctic Domain between 2011 and 2013, with COSEE Alaska helping to coordinate with local communities, students and various media and develop a virtual field trip featuring scientists and traditional knowledge.

Dr. Ray Barnhardt, COSEE Alaska P.I. and Director, UAF Center for Cross-cultural Studies, Elena Sparrow, UAF faculty member, International Arctic Research Center

Researchers requested that COSEE Alaska partner in a grant proposal to the NSF Climate Change Education Center grant program.

Jan Straley, UAS faculty member, and Chief Scientist, Sitka Sound Science Center

A researcher requested assistance in developing a proposal for a climate change education center for the Gulf of Alaska region in response to an NSF Call for Proposals. COSEE Alaska also acted as a catalyst to assist the researcher in developing broader geographic partnerships with other organizations collaborating on projects for the Gulf of Alaska region, which included a proposal by a partnership of organizations based in Cordova, Alaska, to develop online environmental data applications and K–12 curriculum for schools and another partnership of organizations based in Anchorage, Alaska, to develop a youth and community-based citizen monitoring program. As a result of discussions facilitated by COSEE Alaska, Sitka Sound Science Center partnered with one of the groups in the proposal and the scientist said that future partnerships had also been forged during the discussions.

Dr. Frank Rack, Executive Director, ANDRILL Science Management Office, University of Nebraska

A researcher requested assistance in the development of a proposal to the NSF COSEE grant program in the Division of Ocean Sciences that would focus on polar seas. COSEE Alaska provided assistance and provided a requested letter of support.

Dr. Patricia Cooper, University of Hawaii

A researcher requested assistance in the development of a proposal to the NSF COSEE grant program in the Division of Ocean Sciences that would focus on ocean sciences and traditional knowledge. COSEE Alaska provided assistance and provided a requested letter of support.

Michelle Ridgway, Alaska Deep Ocean, Inc.

A researcher requested assistance and partnership in developing the broader impacts section of a proposal to NSF for a submersible research expedition into the Bering Seas Canyons. COSEE Alaska assisted in design of a collaborative virtual field trip that would be implemented by the Alaska Sea Life Center, COSEE Alaska's informal education partner; involvement of students and community members on cruises and programming in Alaska Native villages, and an aquarium display.

Sinead Farrell, Research Associate, NOAA Lab for Satellite Altimetry

A researcher requested assistance in designing the education and outreach activities for broader impacts section of a proposal to NSF Arctic Research Opportunities grant program. The researcher was seeking contacts to involve teachers, students, and Native Alaskan sea ice specialists in a sea ice research involving a camp on the Arctic ice cap.

Darcy Dugan, Program Manager, Alaska Ocean Observing System

A program manager requested assistance for a proposal to NOAA entitled "Developing Coastal & Marine Planning and Decision Support Tools for Alaska and the US Arctic." COSEE Alaska would assist with education and outreach by engaging climate change scientists as mentors for our ocean science fairs in coastal communities, as speakers showcasing this tool at our annual Communicating Ocean Science Fair at the Alaska Marine Science Symposium, and in professional development workshops where we would bring together teachers and scientists to ensure the tool is useful for formal and informal educators.

2009

Gregory Newby, UAF Alaska Regional Supercomputing Center, Elizabeth O'Connell, WonderVisions, Inc.

A researcher and media specialist requested assistance in the development of a proposal to develop a series of podcasts by scientists related to climate change science in Alaska's national parks for a grant proposal to the NSF Informal Science Education grant program. COSEE Alaska provided a letter of support. The grant application was successful.

Sarah Hardy, UAF faculty member, School of Fisheries and Ocean Sciences, Matthew Wooler, Graduate Student, UAF Institute of Arctic Biology, Laura Dehn, Faculty, UAF/SFOS

Researchers requested assistance in designing education and outreach activities for grant proposals to the North Pacific Research Board, including contacts with Alaska Native communities to include a traditional ecological knowledge component in the projects and effective education and outreach strategies. The proposals submitted by Matthew Wooler and Laura Dehn were funded.

Aaron Poe, Scientist, U.S. Forest Service, Cordova Ranger District, Chugach National Forest, Mandy Lindeberg, Scientist, NOAA Marine Fisheries Lab

Researchers requested assistance in design of a citizen science project to involve youth in collecting evidence of ocean climate change in the Gulf of Alaska and participate in forums to discuss the issue of climate change for a proposal to the NOAA Environmental Literacy grant program.

Broader Impacts Opportunities/Support provided to researchers by COSEE Alaska (not proposal submissions)

2010

Tom Weingartner, UAF faculty member, School of Fisheries and Ocean Sciences, Hajo Eichens, UAF faculty member, Geophysical Institute, Phyllis Stabeno, oceanographer, NOAA Pacific Marine Laboratory

COSEE Alaska provided researchers an opportunity to achieve broader impacts of their research by participating in interviews by Ari Daniel Shapiro, COSEE NOW. The interviews were combined with those of Alaska Natives to develop an “Ocean Gazing” podcast co-produced by COSEE Alaska and COSEE NOW on sea ice, observing systems, and climate change impacts of melting Arctic sea ice.

Kate Wynne, UAF faculty member and Alaska Sea Grant Marine Mammal Specialist, School of Fisheries and Ocean Sciences

A researcher requested that COSEE Alaska sponsor and plan a professional development workshop for educators in marine education and a professional development workshop for scientists about communicating science as part of a community-based Kodiak Alaska Marine Science Symposium in April 2011.

C.J. Ray and other Alaska SeaLife Center scientists

COSEE Alaska provided opportunities for researchers to participate in a professional development workshop for teachers and provided support and guidance to achieve broader impacts by making presentations about their research and interacting with Kenai Peninsula

School District teachers during a two-day workshop which COSEE Alaska co-sponsored. The impact of the scientists' participation was evaluated by COSEE Alaska.

George Matsumoto, Monterey Bay Aquarium Research Institute Senior Education and Research Specialist, Nick Bond, University of Washington faculty member, Joint Institute for the Study of the Atmosphere and the Ocean, Seth Danielson, UAF graduate student, School of Fisheries and Ocean Sciences, Emily Davenport, Resource Coordinator, University of Georgia, Department of Marine Sciences, Henry Huntington, Huntington Consulting, social science consultant, Tom Van Pelt, Program Manager, Bering Sea Integrated Research Program, North Pacific Research Board, Francis Wiese, Science Director, North Pacific Research Board, Hajo Eichens, UAF faculty member, Geophysical Institute, Rodger Harvey, Chesapeake Bay Biological Lab, Univ. of Maryland, Ray Sambrotto, Lamont-Doherty Earth Observatory (LDEO), Mike Sigler, NOAA Alaska Fisheries Science Center, Andrew Trites, University of British Columbia faculty member, Marine Mammal Research Unit, Ray Barnhardt, COSEE PI, UAF faculty, Center for, Cross-cultural Studies, COSEE Alaska

COSEE Alaska provided opportunities for researchers to participate in a professional development workshop for teachers and provided support and guidance to achieve broader impacts by making presentations about their research and interacting with 11 teachers who had research experience or local knowledge related to the Bering Sea Ecosystem Study during a four-day workshop which COSEE Alaska co-sponsored. Scientists and teachers interacted both formally through the presentations and informally to collaborate in the development of new lesson plans that will be compiled with other educational resources into the Bering Sea Collection in the Arctic Research Consortium of the U.S. (ARCUS) Learning Resource Database (<http://www.polartrec.com/resources>). COSEE Alaska evaluated the impact of scientists' participation in the workshop.

Michael Castellini, COSEE Alaska P.I. and UAF faculty member, Interim Dean of the School of Fisheries and Ocean Sciences, Ray Barnhardt, COSEE P.I. and UAF faculty member, Center for Cross-cultural Studies, Russ Andrews, UAF faculty member, School of Fisheries and Ocean Sciences, Ann Knowlton, UAF post-doctoral student, School of Fisheries and Ocean Sciences, Amy Rath, UAF Master's student in Oceanography School of Fisheries and Ocean Sciences, , Laura Conner, UAF faculty member, science education research affiliated with the Museum of the North

COSEE Alaska provided an opportunity for researchers to participate in a COS/COSIA training course to learn how they could implement similar courses within the Alaska university system to increase student capacity to address the broader impacts of their research. Researchers involved in instruction of the UAF SFOS course scheduled for spring, 2011, met with COSEE Alaska staff to complete course planning. COSEE California evaluated the impact of the scientists' participation in the workshop.

Amy Rath, UAF graduate Student, Oceanography, School of Fisheries and Ocean Sciences

A graduate student requested assistance in the development of her graduate research project that would involve a strong education and outreach component and possible funding sources. She

also requested guidance on a career path that would combine research and education and outreach and asked a COSEE staff member to serve on her graduate committee.

Robert G. White, UAF emeritus faculty member, Director of the Institute of Arctic Biology, Lawrence Duffy, UAF faculty member, Institute of Chemistry and Biochemistry; Interim Dean of the Institute of Arctic Biology

Researchers requested a COSEE Alaska–sponsored “communicating science” mini–course in conjunction with the AAAS Arctic Division Conference to be held in Dillingham, Alaska in September 2011.

Amanda Rosenberger, UAF/School of Fisheries and Ocean Sciences, Kristen Shakes, UAF/School of Fisheries and Ocean Sciences, Nancy Fresco, Scenarios for Network Applications Planning (SNAP) Program, UAF affiliate, Catherine Moncrieff, Anthropologist, Yukon River Drainage Fisheries Association

COSEE Alaska provided opportunities for researchers to participate in a professional development workshop for teachers and provided support and guidance to achieve broader impacts by making presentations about their research and interacting with 21 Alaska rural school teachers participating in a “Salmon in the Classroom” workshop which COSEE Alaska co–sponsored. Eighteen of the teachers teach in classrooms where Alaska Native students are in the majority. The impact of their participation was evaluated by COSEE Alaska.

Brenda Konar, UAF Faculty member, School of Fisheries and Ocean Sciences, Ann Knowlton, UAF Post–Doc, School of Fisheries and Ocean Sciences

Review and assistance with an international project to design, publish, and distribute a children’s activity related to the Census of Marine Life. Assistance with publication and distribution in Alaska.

Michael Castellini, COSEE Alaska P.I. and UAF Interim Dean, School of Fisheries and Ocean Sciences (SFOS), Elena Sparrow, UAF faculty member, International Arctic Research Center, Russ Hopcroft, UAF faculty member, SFOS, Sarah Hardy, UAF faculty member, SFOS, Ron Smith, UAF Professor Emeritus, SFOS, Nora Foster, Coordinator, Ichthyology and Aquatics Collections, UAF Museum of the North, Ruth Post, Program Coordinator, UAF Institute of Coastal Research, Laura Conner, Director of Public Program, UAF Museum of the North, and P.I., NSF GK–12 Program, Brook Gamble, Outreach and Education Specialist, UAF/NOAA Alaska Center for Climate Assessment and Policy , Tania Spurkland, Graduate Student, UAF SFOS, Amy Tippery, Graduate Student, UAF SFOS, Mandy Keogh, Graduate Student, UAF SFOS, Jared Weems, Graduate Student, UAF SFOS

COSEE Alaska PIs and staff gave a university–wide seminar sponsored by SFOS to review broader impacts requirements and describe how COSEE Alaska could provide support to scientists in developing proposals and finding education and outreach partners in Alaska communities. COSEE Alaska PIs and staff also toured the University of Alaska Museum of the

North and discussed potential collaboration, including their role in the Spring 2011 COS/COSIA course.

Mandy Lindeberg, NOAA Scientist, Sandra Lindstrom, Faculty Research Scientist, University of British Columbia

Researchers requested an editorial review of manuscript for applicability to a general public audience. Alaska Sea Grant published the book.

Communicating Ocean Science Workshop/Alaska Marine Science Symposium, Anchorage, Alaska (80 scientists, 40 educators and community members)

COSEE Alaska partnered with the North Pacific Research Board (NPRB) and the Alaska Ocean Observing System (AOOS) for the second time to co-sponsor a half-day workshop in conjunction with the Alaska Marine Science Symposium (AMSS). The AMSS is a free symposium, which draws more than 750 ocean scientists, educators, and community members from the U.S., Canada, and Russia to share ocean research ongoing in Alaska's Seas. Educators, scientists, students, media, and community members shared experiences and highlighted "best practices" of national, regional and local ocean education and outreach programs. Luncheon discussions about SEANET, a network of scientists and educators focused on communicating Alaskan ocean and climate change science followed the workshop. COSEE Alaska Project Evaluator Andi Anderson summarized the results of the workshop and discussions in evaluation reports.

The agenda included presentations by COSEE National Advisory Council member Dr. George Matsumoto, COSEE California PI Craig Strang, and COSEE OS PI Annette de Charon. They shared their experiences with the COSEE Network, the COS/COSIA courses developed by COSEE California, the use of concept maps, and new media. Other speakers included: 1) a scientist-teacher team who shared their experience partnering in a year-long activity to bring real-time ocean research at the Vancouver Aquarium on captive seal pups into the classroom and curriculum of an elementary teacher from a remote island in the Bering Sea near where the pups had been captured; and 2) an Alaska Native sharing guidelines and best practices for scientists sharing research with Alaska Native communities. In the evaluation report for these activities, Dr. Anderson write that attendance for the Communicating Ocean Sciences Workshop was nearly 50% higher than previous years (2007-2009).

Findings from the event show that COSEE Alaska effectively identified areas of interest and need for the audience and provided programming that was useful and likely to be used. All the sessions were interesting to the participants, but the Pribilof Islands-Fur Seal research, involving an ocean scientist, a teacher and Alaska Native students was most captivating and compelling to the audience. She repeated the conclusion from her evaluation of the 2009 workshop that the COSW is an education and outreach model that ought to be widely shared with the COSEE Network. Among survey respondents, 81% rate having educators and scientists collaborate in this manner as having "Vast" value (the highest rating option possible).

AMSS Luncheon Presentations (Approximately 500 scientists)

In addition to the COS workshop which took place on the first day of the AMSS, COSEE Alaska also cosponsored luncheon presentations to showcase best practices in outreach and broader impacts with all Symposium participants. The first luncheon featured National Ocean Science Bowl competitions between local high school students and teams of academic and NOAA scientists. Other speakers included Dr. Larry Mayer with a popular talk about mapping the Arctic seafloor. Mike Beck from The Nature Conservancy discussed marine protected areas and coastal and marine spatial planning and Charlotte Vick from Deep Search Foundation encouraged scientists to share their research on the new GOOGLE Ocean platform.

Other AMSS Workshops (Approximately 150 scientists)

COSEE Alaska coordinated the education and outreach strand of an Ocean Acidification Workshop, leading a break-out discussion with scientists, journalists and educators, and hosted a well-attended GOOGLE Ocean workshop.

Alaska Ocean Literacy Award

COSEE Alaska sponsored the first annual Alaska Ocean Leadership Award for Ocean Literacy given to the Kenai Fjords Tours Marine Science Explorer Program at the Alaska SeaLife Centers' Ocean Gala, held on the eve of the Alaska Marine Science Center and attracting ocean scientists who mingled with Alaska leaders at the black-tie event. As part of CIRI Alaska Tourism, Kenai Fjords Tours has provided unique vessel-based programs for over 36,000 students and teachers since 1995. The Ocean Literacy Award goes to an individual, team or institution that has made a breakthrough in promoting ocean literacy in Alaska among a segment of the general population via formal or informal education, outreach or other communications.

2009

Seth Danielson, graduate student in Oceanography, UAF SFOS, Martha Kopplin, GLOBE Program Coordinator, UAF International Arctic Research Center, Mark Wipfli, UAF faculty member, SFOS

COSEE Alaska provided opportunities for researchers to participate in a professional development workshop for teachers and provided support and guidance to achieve broader impacts by making presentations about their research and interacting with 18 Alaska rural school teachers participating in a "Salmon in the Classroom" workshop which COSEE Alaska co-sponsored. Most of the teachers taught in classrooms where Alaska Native students were in the majority. The impact of the scientist participation was evaluated by COSEE Alaska.

Andrew Trites, Associate Professor and Director of the Marine Mammal Research Unit in the Fisheries Centre at University of British Columbia, Research Director for the North Pacific Universities Marine Mammal Research Consortium Marine Mammal Lab, Bering Sea BEST/BSIERP Project Researcher

COSEE–Alaska provided financial support for a field trip by St. Paul Island fourth and fifth–graders to Vancouver, B.C. to visit Dr. Trites’ Marine Mammal Lab and the Vancouver Aquarium where he was conducting captive rearing experiments on fur seal pups captured near St. Paul in the Pribilof Islands. The trip was a culmination of a year–long collaboration between Dr. Trites and teacher Tonia Kushin to involve her students in his research. Tonia Kushin and Dr. Trites shared the details of their collaboration at the 2010 COSW and both were involved in the Bering Sea Scientist–Teacher Professional Development Workshop to develop additional lesson plans and activities.

Communicating Ocean Science Workshop/Alaska Marine Science Symposium, Anchorage, Alaska (30 scientists, 35 educators and community members)

COSEE Alaska partnered with the North Pacific Research Board (NPRB) and the Alaska Ocean Observing System (AOOS) to co–sponsor a half–day workshop in conjunction with the Alaska Marine Science Symposium (AMSS), which draws more than 750 ocean scientists, educators, and community members. Nora Deans, current COSEE Alaska Director, first organized the workshop in 2007 in her previous role as Outreach Director for NPRB. In 2009, with COSEE Alaska project support and the involvement of the COSEE PIs, the workshop was expanded to place additional emphasis on providing scientists with tools and skills to improve their education and outreach efforts. Educators, scientists, students, and community members shared experiences and highlighted “best practices” of national, regional and local ocean education and outreach programs. Luncheon discussions about SEANET, a network of scientists and educators focused on communicating Alaskan ocean and climate change science followed the workshop. COSEE Alaska Project Evaluator Andi Anderson summarized the results of the workshop and discussions in evaluation reports. In addition to the COS workshop which took place on the first day of the AMSS, COSEE Alaska also cosponsored luncheon presentations to showcase best practices in outreach and broader impacts with all Symposium participants.

The COS workshop agenda included scientists sharing experiences with teachers at sea; data visualization ideas for scientists and educators; tips for taking videos in the field, an introduction to COSEE Alaska and an update on the new Alaska Seas and Rivers curriculum which features the latest Alaska ocean research in the case studies, thanks to scientists participating in teacher curriculum writing workshops at Kasitsna Bay. The workshop attracted approximately 65 individuals, primarily made up of scientists and graduate students, with community members and informal educators from state and federal agencies and informal learning centers as well. In the evaluation report for these activities, Dr. Anderson wrote that attendees noted that workshop sessions were interesting and useful, offered new ideas for educational outreach and most audience members were interested in considering how to use the approaches with their own scientific research. Audience members were very interested in linking scientists and educators in collaborative endeavors, and saw SEANET as offering a great opportunity to help facilitate collaborations. She concluded “the Communicating Ocean Science workshop is a highly successful model for helping scientists share and learn about best practices for educating others about their research. The event also provides opportunities for scientists to hear from educators about possible ways to plug in to effective educational practices.”

AMSS Luncheon Presentations (Approximately 500 scientists)

In addition to the COS workshop which took place on the first day of the AMSS, COSEE Alaska also cosponsored luncheon presentations to showcase best practices in outreach and broader impacts with all Symposium participants. These presentations featured a National Ocean Science Bowl competition between local high school students and between teams of academic and NOAA scientists and a presentation by Geoffrey Haines–Stiles, co–creator of the NSF–NASA funded International Polar Year communication program, “Polar Palooza.”

A number of the scientists and Alaska Natives in the audience were “stars” of this cutting–edge multimedia event that traveled to informal education venues all over the U.S. Geoffrey shared the development of the program and initial evaluations, culminating his presentation with the rap music video, “Take Aim at Climate Change,” which delighted the audience.

Ongoing

COS/COSIA Course (Up to 24 UAF graduate students)

COSEE Alaska set the groundwork for bringing a COS/COSIA course to Alaska in the spring of 2011. In January, COSEE PI Dr. Castellini organized a site visit and tour of SFOS–University of Alaska Fairbanks–COSEE Alaska operations for Craig Strang, COSEE California. COSEE Alaska and SFOS partnered with the UAF Museum of the North and the UAF Department of Wildlife and Fisheries and their NSF–funded GK–12 program, which has a focus on climate change, to develop a trial graduate–level course for the GK–12 students from several departments and students from SFOS in both Fairbanks and Juneau. The informal education partner in Juneau will be the State Museum, which has a NOAA Science–on–a–Sphere exhibit. The course will be a unique adaptation of the COSEE California model to include traditional Native knowledge as a way of knowing, a combination of distance delivery and guided instruction at the Juneau location, and instruction in pedagogy that will cover aspects of both formal and informal education. COSEE Alaska instructors, including PIs from COSEE’s other informal education partner, the Alaska SeaLife Center, will contribute the ocean literacy context and ocean science content. A class syllabus and curriculum review forms were approved by UAF Academics in September and the course will be offered in spring semester, 2011.

COSEE Alaska cosponsored a training workshop with COSEE California at UAF in October. Marilyn Sigman, COSEE Alaska Program Manager, who will co–instruct the course, participated in the workshop with the other instructor from the UAF Museum and partners at the State Museum and the University of Alaska Southeast (UAS) to provide guided instruction in Juneau. Other participants included faculty from the UAF Dillingham rural campus and UAS, which are potential locations for future courses.

Website

Dr. Castellini, who has been a member of the acclaimed NSF–funded climate change outreach program “Polar Palooza” since its creation, has promoted COSEE Alaska nationally and internationally through his website <http://www.sfos.uaf.edu/directory/faculty/castellini/>

North Pacific Research Board Grant Guidelines

Beginning in 2009, COSEE Alaska was listed as a resource for scientists in the North Pacific Research Board (NPRB) guidelines about best practices for the outreach and education required in grant applications during the request for proposals process. COSEE Alaska developed a document to provide guidance about effective outreach and education strategies, which is linked to the section of the request for proposals that requires education and outreach activities.

SEANET (300 – 350 scientists)

COSEE Alaska organized and grew SEANET, a network of scientists, students, and community members in Alaska interested in communicating about Alaska ocean climate change from both scientific and Alaska Native traditional perspectives. In 2010, the COSEE Alaska PIs developed a governance document for SEANET and staff organized a Steering Group, which includes representatives from the ocean science community, informal and formal education institutions, media outreach specialists, students and community members. This group meets by audio-conference.

An annual meeting is held after the Communicating Ocean Science Workshop (COSW). SEANET was formally launched at the meeting in January 2009, but the need for such a network and the functions it could fulfill were discussed at similar workshops in 2008 and 2007. A core group includes representatives of more than 80 organizations and agency units, including the major marine research institutions in Alaska as well as a number of universities and consultants outside of Alaska (including several in Russia and Canada) who conduct research within the region, state and federal agencies that employ both researchers and education/outreach specialists, Alaska Native organizations and communities involved in natural resource management, and non-profit organizations that provide informal marine education to Alaska communities, schools, and visitors. 100 people in attendance at the 2010 meeting discussed the SEANET organization as an opportunity to interact and to engage with other ocean science education activities. SEANET members were also enlisted to host the National Marine Educators Association Conference in 2012, which is one of COSEE Alaska's signature activities.

COSEE Alaska provides communication support and resources to this broad network. In October of 2009, more than 300 scientists, educators, and science communicators were contacted via email to become members of the SEANET listserv and encouraged to join a SEANET social networking website, <http://oceanseanet.ning.com>. Both the listserv and networking site have been advertised at education and science conferences and on other listservs for Alaska scientists and educators. The SEANET listserv has grown to 350 members and membership in the networking site has grown to 175 members. COSEE Alaska sends out frequent mailings to the listserv and networking group highlighting recent science news stories and resources for communicating and teaching about marine literacy, Alaska ocean climate change, and Alaska Native knowledge related to climate change. Postings have included more than 70 blog items (science news stories, science education news stories, requests to pilot lesson plans, and science outreach opportunities) 50 featured resources reports, books, web pages, lesson plans, and new COSEE Alaska publications), and calendar information for numerous conferences, workshops, and science outreach events and opportunities. The items posted to the networking site are

archived on the COSEE Alaska website and a link is provided on the COSEE Alaska website to join the networking site.

Traffic to the networking site between November 23, 2009, and December 5, 2010, has been 2,723 visits (1,602 of them unique visitors) to 1,495 pages with a total of 9,768 page views and an average viewing of 3.6 pages/visit. The highest number of visits to the networking site have been to the homepage and the members page followed by specific blog stories with the most viewed science news stories about the mixed effects of ocean acidification on marine invertebrates, the breaking news story about emails stolen from climate change scientists, and the implications about sea ice melt for ocean acidification.

Megan Murphy, Scientist, Coastal Training Program, NOAA/ADFG Kachemak Bay Research Reserve

COSEE Alaska Program Manager Marilyn Sigman serves on the Advisory Group for the Coastal Training Program by request of a researcher. The program mission is to provide up-to-date scientific information and skill-building opportunities to individuals who are responsible for making decisions that affect coastal resources along the Kenai Peninsula and coastal South Central Alaska.

COSEE Pacific Partnerships

Proposal Assistance provided by COSEE-PP

George von Dassow, Senior Research Associate, Oregon Institute of Marine Biology, University of Oregon, December 2008

Researcher sought consultation, assistance with design, and review of the Criterion 2 section of an NSF-MCB: Cellular Systems proposal. This proposal was funded and includes support for a community college student intern in the COSEE-PP program Promoting Research Investigations in the Marine Environment (PRIME).

Julie Huber, Assistant Scientist, Marine Biological Laboratory, February 2009

Researcher sought consultation, assistance with design, and review of the Criterion 2 section of an NSF-OCE: Biological Oceanography proposal. This proposal was funded and includes support for community college curriculum development and pilot testing.

Craig Young, Professor, Oregon Institute of Marine Biology, University of Oregon, March 2009

Researcher sought consultation, assistance with design, and review of the Criterion 2 section of an NSF-DBO: Field Stations and Marine Labs proposal. This proposal was funded and includes support to obtain an ROV that will be used by marine station scientists who will continue to develop opportunities for COSEE-PP programs.

Jessica Miller, Assistant Professor, Oregon State University, April 2009

Researcher sought consultation, assistance with design, and review of the public engagement, outreach and education requirements for this Oregon Sea Grant proposal. Status: Not funded

Craig Young, Professor, Oregon Institute of Marine Biology, University of Oregon, May 2009

Researcher sought consultation, assistance with design, and review of the public engagement, outreach and education requirements for this Oregon Sea Grant proposal. Status: Not funded

Elise Granek, Assistant Professor, Portland State University, May 2009

John Harrison, Assistant Professor, School of Earth and Environmental Sciences, Washington State, Vancouver

Researcher sought consultation, assistance with design, and review of the public engagement, outreach and education requirements for this Oregon Sea Grant proposal. The proposal was not funded. Dr. Granek helped organize a communications workshop for ocean scientists in the Portland, OR area and was Co-PI on a COSEE-PP NSF-ISE proposal submitted in 2010.

Svetlana Maslakova, Assistant Professor, Oregon Institute of Marine Biology, University of Oregon, January 2010

Researcher sought consultation, assistance with design, and review of the Criterion 2 section of an NSF Collaborative Research proposal. Status: not funded

Jessica Miller, Assistant Professor, Oregon State University, January 2010

Researcher sought consultation, assistance with design, and review of the Criterion 2 section of an NSF Collaborative Research proposal. The proposal was funded and included support for a community college student in the PRIME program.

Frederick Pahl, Professor of Chemical Oceanography, College of Oceanic and Atmospheric Sciences, Oregon State University, February 2010

Researcher sought consultation, assistance with design, and review of the Criterion 2 section of an NSF–OCE: Chemical Oceanography. The proposal was not funded; however, this interaction led to an on–going dialogue about outreach opportunities with COSEE–PP. During summer 2010, Dr. Pahl developed and led a day–long module on ocean observing systems for a COSEE–PP community college faculty professional development institute.

Ricardo Letelier, Professor of Biological Oceanography, College of Oceanic and Atmospheric Sciences, Oregon State University, February 2010

Researcher sought consultation, assistance with design, and review of the Criterion 2 section of an NSF–OCE: Biological Oceanography proposal. Status: not funded

Richard Emlet, Professor, Oregon Institute of Marine Biology, University of Oregon, March 2010

Brian Bingham, Professor, Shannon Point Marine Center, Western Washington University
Additional Science Faculty at Oregon State University, UO, and WWU

COSEE–PP PIs Hodder and Rowe assisted researches in developing a joint Oregon State University / University of Oregon pre–proposal for the NSF Integrative Graduate Education and Research Traineeship Program (IGERT) that would involve scientists and graduate students in the College of Oceanic and Atmospheric Sciences at OSU, the UO Oregon Institute of Marine Biology, and Western Washington University’s Shannon Point Marine Center.

Robert Harris, Associate Professor of Marine Geology & Geophysics, College of Oceanic and Atmospheric Sciences, Oregon State University, August 2010

Researcher sought consultation, assistance with design, and review of the Criterion 2 section of an NSF–OCE Marine Geology and Geophysics proposal. Status: Pending

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Stephen Henderson, Assistant Professor, Washington State University, Vancouver, August 2010

Researcher sought consultation, assistance with design, and review of the Criterion 2 section of an NSF–OCE: Physical Oceanography proposal. Status: Pending

James McManus, Professor of Marine Geology and Geophysics, College of Oceanic and Atmospheric Sciences, Oregon State University, August 2010

Researcher sought consultation, assistance with design, and review of the Criterion 2 section of an NSF–OCE: Marine Geology and Geophysics proposal. Status: Pending

Richard Emlet, Professor, Oregon Institute of Marine Biology, University of Oregon, August 2010

Researcher sought consultation, assistance with design, and review of the Criterion 2 section of an NSF–OCE: Biological Oceanography proposal. Status: Pending

George Waldbusser, Assistant Professor of Biological Oceanography, College of Oceanic and Atmospheric Sciences, Oregon State University, August 2010

Researcher sought consultation, assistance with design, and review of the Criterion 2 section of an NSF–OCE: Biological Oceanography proposal. Status: proposal will be submitted in next round

Emilio Mayorga, Oceanographer, Applied Physics Lab, University of Washington, March 2010
Amy Sprenger, Education Specialist, Northwest Association of Networked Ocean Observing Systems

Researchers sought support for a NOAA Environmental Literacy for Informal Science Education program proposal. COSEE–PP committed to assisting NANOOS develop learning modules focused on ocean dynamics along the Oregon and Washington coast that would support partnerships between ocean scientists and volunteer groups who conduct citizen science projects. Status: Pending. Support for this proposal grew out of an ongoing collaboration between COSEE–PP and NANOOS staff.

Christina Hulbe, Associate Professor of Geology, Portland State University, May 2010

Researcher sought support for an NSF Climate Change Education Program proposal on translating climate science research into educational practice. Status: Pending

COSEE–PP Assistance for Education and Outreach Proposals

Tom Gaskill, Education Coordinator, South Slough National Estuarine Research Reserve, April 2008 and January 2009

PI sought support for a NOAA Bay–Watershed Education and Training Program. The Oregon Coastal Education Initiative proposal was funded in 2009 and included support for workshops for informal educator professional development.

Shawn Rowe, Assistant Professor, Oregon State University, 2009

PIs sought support for the NSF–ISE proposal Communicating Ocean Sciences Informal Education Network. The proposal was funded and included support for informal educator and scientist professional development workshops.

Shawn Rowe, Assistant Professor, Oregon State University, 2009

PIs sought support for an Oregon Department of Education grant. The Oregon Coast Aquatic and Marine Science Partnership proposal was funded and includes support for educator and scientist professional development workshops.

Workshops

2009 series of Engaging Scientists Workshops

February 27 – Engaging Scientists Workshop at Oregon State University (OSU)

*Hal Batchelder, Professor, College of Oceanic & Atmospheric Sciences, OSU

Kelly Benoit–Bird, Assistant Professor, College of Oceanic & Atmospheric Sciences, OSU

*Robert Collier, Professor, College of Oceanic & Atmospheric Sciences, OSU

Carmel Finley, History Department, OSU

Gayle Hansen, Courtesy Faculty, Botany and Plant Pathology, College of Science, OSU; Pacific Coastal Ecology Branch, Western Ecology Division, Environmental Protection Agency

James Lerczak, Associate Professor, College of Oceanic & Atmospheric Sciences, OSU

*Bob Lillie, Professor, Department of Geosciences, College of Science, OSU

Craig Risien, Faculty Research Assistant, College of Oceanic & Atmospheric Sciences, OSU

April 27 – Engaging Scientists Workshop at Portland State University (PSU)

David Cacchione, Senior Scientist Emeritus; Retired United States Geological Survey Coastal and Marine Programs

Catherine de Rivera, Assistant Professor, Environmental Sciences and Management, College of Liberal Arts and Sciences, PSU

*Elise Granek, Assistant Professor, Environmental Sciences and Management, College of Liberal Arts and Sciences, PSU

*John Harrison, Assistant Professor, School of Earth and Environmental Sciences, Washington State, Vancouver

*Steve Henderson, Assistant Professor, School of Earth and Environmental Sciences, Washington State, Vancouver

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Gretchen Rollwagen–Bollens, Professor, School of Earth and Environmental Sciences,
Washington State, Vancouver

*Ed Zaron, Senior Research Associate, College of Civil and Environmental Engineering, PSU

Engaging Scientists Workshop at the Center for Coastal Margin Observation and Prediction
(CMOP), Oregon Health and Science University (OHSU), April 28

Philip Barrett, Director of Special Projects, CMOP; Division of Environmental and Biomolecular
Systems, Department of Science and Engineering, OHSU

Suzanne DeLorenzo, Graduate Student Microbiology, CMOP; Division of Environmental and
Biomolecular Systems, Department of Science and Engineering, OHSU

Joe Needoba, Assistant Professor; Affiliate Scientists, CMOP Biogeochemistry Division of
Environmental and Biomolecular Systems, Department of Science and Engineering, OHSU

Sandra Oster, Senior Research Associate, Scientific Writer & Editor, CMOP; Division of
Environmental and Biomolecular Systems, Department of Science and Engineering, OHSU

Tawnya Peterson, Research Assistant, Professor; Affiliate Scientist, CMOP Biological
Oceanography Division of Environmental and Biomolecular Systems, Department of Science
and Engineering, OHSU

Jeff Schilling, Web/Marketing Coordinator, CMOP

Charles Seaton, Research Associate, CMOP; Division of Environmental and Biomolecular
Systems, Department of Science and Engineering, OHSU

Elizabeth Woody K–12 & STEM Education in Native Community Schools Program
Coordinator, CMOP

Engaging Scientists Workshop during the Oregon Marine Labs Graduate Student Exchange
event at the Hatfield Marine Science Center (HMSC), Oregon State University (OSU), May 29

Heather Austin, M.S. Student, Oregon Institute of Marine Biology, U. of Oregon

Renee Bellinger, Science Coordinator, Collaboration Research on Oregon Ocean Salmon
Project, Coastal Oregon Marine Experiment Station, HMSC, OSU

Kathleen Bennett, M.S. Student, Oregon Institute of Marine Biology, U. of Oregon

Erin Cooper, PhD Candidate, Oregon Institute of Marine Biology, U. of Oregon

Ruth DiMaria, M.S. student, Fisheries and Wildlife, HMSC, OSU

Gregory Gavelis, Oregon Institute of Marine Biology, U. of Oregon

Amanda Gladics, Bio Science Technician, U.S. Fish and Wildlife Service

Rebecca Hamner, Faculty Research Assistant, Marine Mammal Institute, HMSC, OSU

Josh Lord, M.S. Student, Oregon Institute of Marine Biology, U. of Oregon

Mattias Johansson, PhD Candidate, Coastal Oregon Marine Experiment Station, Fisheries and
Wildlife, HMSC, OSU

Jose Marin Jarrin, PhD Candidate, Fisheries Science Fisheries and Wildlife, HMSC, OSU

Myndee McNeill, M.S. Student, Oregon Institute of Marine Biology, U. of Oregon

Erin Morgan, M.S. Student, Oregon Institute of Marine Biology, U. of Oregon

Stephanie Schroeder, PhD Candidate, Oregon Institute of Marine Biology, U. of Oregon

Walaa Shaban, Visiting Graduate student, Oregon Institute of Marine Biology, U. of Oregon

Debbie Steel, Faculty Research Assistant, Marine Mammal Institute, HMSC, OSU

Londi Tomaro, M.S. Student, Fisheries Science, Fisheries and Wildlife, OSU

In 2009, COSEE–PP offered a series of Engaging Scientists workshop in Oregon that provided scientists with information about the COSEE network and specific activities being undertaken by COSEE–PP. The workshop focused on ways in which scientists can engage in these activities and engaged the participants in a dialogue about their research and their broader impact goals. Workshop activities covered effective communication practices and effective strategies for building partnerships for education and outreach. As part of these workshops, we encouraged scientists to contact us for assistance in developing broader impact activities and offered to provide support for grant proposal that have the potential to involve outreach facilitated by COSEE–PP. The * next to a scientists name indicates that we have subsequently worked with these scientists.

Building Better Educational Displays and Activities, Hatfield Marine Science Center, Oregon State University, June 5

COSEE–PP offered a special topics workshop on building better educational displays and activities for university and agency scientists and program managers planning to participate in Sea Fest, the Hatfield Marine Science Center annual community outreach event. COSEE–PP Co–PI PI Rowe and Bill Hanshumaker, Public Marine Education Specialist, Oregon Sea Grant Extension, worked with participants on identifying the desired learning outcomes for their displays and then designing or redesigning activities, posters, or other materials to meet those outcomes, to be more engaging, and to better communicate their work.

2010

Scientist–Informal Educators Collaboration Concept Mapping Workshop, California Polytechnic State University, May 24–26

Scientist participants:

Nikki Adams, Assistant Professor, Biological Sciences Department, California Polytechnic State University

Paul Choboter, Assistant Professor, Mathematics Department, California Polytechnic State University; Center for Coastal Marine Science

Mark Moline, Director, Center for Coastal Marine Sciences and Professor Biological Oceanography, Biological Sciences Department, California Polytechnic State University

Lisa Needles, PhD student, Department of Ecology, Evolution and Marine Biology, University of California, Santa Barbara

Lars Tomanek, Assistant Professor, Biological Sciences Department, California Polytechnic State University

COSEE–PP, in collaboration with COSEE–Ocean Systems and the COSIA Educators Network, offered a three–day scientist–informal educator collaborative concept mapping workshop for ocean scientists from California Polytechnic State University, San Luis Obispo, and informal educators from the central California coast. The workshop paired five ocean scientists (listed above) with fifteen informal educators to create concept maps of the scientists' work that could

be used to develop programming at each ISE site. The workshop engaged new scientists and informal educators in COSEE–PP activities and helped broker relationships locally between ocean scientists and informal educators that will help these scientists meet their broader impacts goals.

Ongoing assistance under an award

Wynn Cudmore, PI, Northwest Center for Sustainable Resources
Jon Yoder, Co–PI, Northwest Center for Sustainable Resources
Lester Reed, Director

COSEE–PP PI Jan Hodder serves on the Advisory Committee as for the NSF–ATE Northwest Center for Sustainable Resources (NCSR). NCSR is a national collaborative of partners from education, business and industry, American–Indian tribes, and government agencies, focused on creating, disseminating, and supporting adaptation of natural resource college–level curriculum materials. In 2009, COSEE–PP assisted the PIs with contacting scientists to make presentations to the community college faculty who attended their professional development institute.

Other

Learning out in the Open, Radio talk show, October 2009

COSEE–PP Co–PI Rowe, working with Dr. John Baek of the Department of Science and Math Education at Oregon State University, Rowe piloted an internet radio show featuring ocean scientists and ocean science communicators hosted online by Blog Talk Radio (<http://www.blogtalkradio.com/>). In four pilot shows, Rowe interviewed five NSF funded scientists and educators, including a marine biologist, a molecular biologist, a documentary filmmaker, a Sea Grant communications expert and an outreach specialist working for NSF. The Engaging Scientists shows were a subset of shows dedicated to informal science learning and teaching sponsored by faculty in the Science and Math Education department.

COSEE Coastal Trends

Engaging Scientists and Integrating Research and Education: Scientist–Educator Partnership Program

(<http://www.coseecoastaltrends.net/programs/scientisteducatorpartnership/>).

Since its inception in fall of 2007, COSEE Coastal Trends has hosted five SEP teams (see www.coseecoastaltrends.net/modules). Because several of the projects involved multiple investigators, the program has served as broader impacts for at least 70 ocean scientists and graduate students. Scientists spend 6 weeks working with team members to convey research science and to create the education module associated with the topic. The other scientists involved with the projects took part in the advisory capacity as co investigators on the project.

2008 Karen McGlathery. University of Virginia VCR/LTER Director

Scientist–Educator Partnership Seagrass Team and 28 scientists.

2008 W. Michael Kemp. UMCES Horn Point Lab

Scientist–Educator Partnership Dead Zone Team and 17 scientists in two science research projects.

2008. Thomas C. Malone UMCES Horn Point Lab.

Observing the Ocean Education Module and 5 additional scientists.

2009. Elizabeth North. UMCES Horn Point Lab.

Scientist–Educator Partnership Fish and Physics and 11 scientists in the NSF BITMAX program.

2009. Dave Kirchner. University of Delaware Institute of Coastal and Marine Science.

Scientist–Educator Partnership Marine Bacteria Module and 4 additional scientists.

W. M. Kemp, W. C. Boicourt, L. Murray, E. North. UMCES Horn Point Lab.

Provided lectures in Coastal Trends Institutes.

D. Stoecker, E. North. C. Pilankas, W. M. Kemp, B. Crump, W. Ball, J. Pierson, K. Tang, P. Glibert, T. Fisher, W. C. Boicourt.

COSEE NOW

Assistance with Broader Impact Statements and Proposals

Since fall 2007, COSEE NOW has supported 43 scientists at 12 institutions to develop "Broader Impacts" plans for their NSF, NOAA and NASA proposals. COSEE NOW has provided assistance to university faculty, aiding in the development of approximately 50 BI statements over three years. Institutions supported include: Rutgers University, Woods Hole Oceanographic Institution (WHOI), Virginia Institute of Marine Science (VIMS), Beacon Institute, University of South Florida, Old Dominion University, University of Massachusetts Amherst, Laboratoire d'Océanographie de Villefranche (LOV) FRANCE, University of Southampton, National Oceanography Centre, Oklahoma State University, Lamont Doherty Earth Observatory (LDEO), and New Jersey Institute of Technology. COSEE NOW's involvement ranged from writing letters of support (80% of interactions), writing 1–2 pages of text/budgets (50%). In all cases, COSEE NOW provided advice and brokered partnerships with education professionals.

Our most successful interactions include a broader impact associated with Dr. Josh Kohut and Adam Kuska's NSF funded science project Modified Circumpolar Deep Water Intrusions as an Iron Source to the Summer Ross Sea Ecosystem funded at \$837,893 (BI was 13% of the total budget). In this project, an interdisciplinary team of researchers is focusing on describing the high productivity patchiness observed in phytoplankton blooms in the Ross Sea, Antarctica. Key hypotheses to be tested and extended are that intrusions of nutrient and micro nutrient (e.g. Fe) rich water masses of the Antarctic modified circumpolar deep water (CDW) up onto continental shelves act to control the biogeochemical response of a large area of the productive Ross Sea coastal region. A novel sampling strategy to be used to test the above hypotheses will employ a remotely controlled deep (1000m) glider (AUV) to locate and map CDW in near real time measuring C (conductivity), T (temperature), D (pressure) and apparent optical properties, and which will serve to direct further ship-based sampling. The adaptive coordination of a polar research vessel with an AUV additionally provides an opportunity to engage in formal and informal education and public outreach on issues in polar research. Education included teacher professional development and live phone calls to middle and high school classrooms offered by Liberty Science Center and Rutgers University as well as a professional blog supported by a professional writer and photographer (see www.coseenow.net).

BI statements written for faculty members are generally well reviewed by NSF panels. See an example review from a scientist's proposal receiving support from the candidate:

*"The project contains a significant educational component with training modules to be developed for high school science teachers through a summer training program with the Mountain Studies Institute in Silverton, CO, and with graduate and undergraduate students participating through workshop and research activities. **Overall, I find the outreach component of this proposal to be the most worthy activity.** The set of research and educational activities described here suggests a rather nicely integrated project.*

*I have rated this proposal **Very Good** because I find that the project as a whole has considerable merit both from the scientific research perspective and just as important*

from promising educational activities and collaborations with a fairly broad spectrum of participants. Hence I would recommend funding the proposal if possible”.

Professional Development for Scientists

Since 2006, Rutgers University has provided professional development for 84 graduate and undergraduate science students (future scientists) through Communicating Ocean Science and Communicating Ocean Science for Informal Audiences (COS/COSIA) undergraduate and graduate classes at Rutgers. VIMS partners have reached 36 faculty and 16 graduate students through teaching COSIA and 4 faculty and 17 graduate students through GK12 professional training experiences.

- Undergraduate/graduate students have shown increased evidence of skills building on core elements of the course including questioning strategies, the learning cycle, assessment, preconceptions, and designing effective science lessons. The partnership with Liberty Science Center grew and included strong mentorship and apprenticeship of teaching skills. S. Glenn and J. McDonnell have remained in professional contact with 17% of the COSIA students as they engage in education and public outreach opportunities through pursuit of graduate school or professional positions.
- Three activities from 2008–2010 were published and are presented daily on the floor of the Liberty Science Center (LSC) by COSIA students.
 - *Exploring Oceans with Robots* activity was created and presented to over 1700 LSC guests from November 2009 through February 2010.
 - *Swimming Fishes* has been presented in LSC summer camps and science residency programs to more than 1000 youth annually.
 - The 2010 class produced six lesson plans on marine transportation using real time data from Rutgers University and other NOAA sources that will be published and utilized regularly by the New Jersey Marine Science Consortium as part of their NY–NJ All Hands on Deck program.

Webinars for Scientists

We have provided professional development training informally and formally for 66 scientists in face-to-face and webinars. We also have reached 32 scientists in town hall professional development trainings in 2009 and 2010. The 2010 four-part series involved collaborations with a philosopher, three scientists, and an evaluator professional offering scientists training on the national impacts and implications of NSF Criterion II, case studies of effective broader impacts, and evaluation techniques and strategies respectively.

Promotion Of Ocean Scientists Work And Direct Assistance With Education And Outreach

Since 2008, COSEE NOW has engaged 414 members including 100 scientists both within the U.S. and internationally. COSEE NOW has great geographic reach within its membership (see www.coseenow.net membership page for updates).

COSEE NOW conducted a five year study in collaboration with the American Society of Limnology and Oceanography (ASLO) assessing scientists' engagement in ocean education and public outreach on a national level (see evaluation documentation for more information on this commitment to understanding the needs of scientists as a focal point for COSEE NOW's work).

Ocean Gazing has been a major service and outreach tool for ocean scientists participating in COSEE NOW. In total Ari Daniel Shapiro has produced 50 podcasts and 5 audio slide shows for a broad range of ocean scientists from a geographic range of institutions. The list of participants in OG include:

John Delaney, University of Washington
Heidi Sosik, Woods Hole Oceanographic Institution
Rob Olson, Woods Hole Oceanographic Institution
Chris Martens, University of North Carolina at Chapel Hill
Kelly Benoit-Bird, Oregon State University
John Orcutt, Scripps Institution of Oceanography and UC San Diego
Frank Vernon, Scripps Institution of Oceanography and UC San Diego
Huijie Xue, University of Maine
Oscar Schofield, Rutgers University
Scott Glenn, Rutgers University
Janice McDonnell, Rutgers University
Jim Yoder, Woods Hole Oceanographic Institution
Barb Kirkpatrick, Mote Marine Lab
Gary Kirkpatrick, Mote Marine Lab
Hugh Ducklow, Marine Biological Laboratory
Jim Miller, University of Rhode Island
Gwyn Griffiths, National Oceanography Centre, Southampton, England
Mick Follows, MIT
Debbie Steinberg, Virginia Institute of Marine Science
Lance Barrett-Lennard, University of British Columbia
Carl Schoch, University of Alaska Fairbanks
Torie Baker, University of Alaska Fairbanks
Joe Banta, Prince William Sound Regional Citizens Advisory Council
Yi Chao, NASA's Jet Propulsion Lab
Chris Sabine, NOAA
Dwight Coleman, Inner Space Center at the University of Rhode Island
Deb Kelley, University of Washington
Julie Morris, NSF
Jack Barth, Oregon State University
Al Plueddemann, Woods Hole Oceanographic Institution
Xiaotong Peng, Tongji University
Kate Larkin, National Oceanography Centre, Southampton, England
Richard Lampitt, National Oceanography Centre, Southampton, England
Gene Feldman, NASA
Ron Zaneveld, Wetlabs
Jim Birch, MBARI

Margaret Leinen, Florida Atlantic University
Margaret McManus, University of Hawaii at Manoa
Frank Muller–Karger, University of South Florida
Katie Rathmell, CMOP
Brian Tarbox, Southern Maine Community College
Tom Weingartner, University of Alaska Fairbanks
Bob Chen, UMass Boston
Andy Fisher, UC Santa Cruz
Jim Manning, NOAA
Bonnie McCay, Rutgers University
Alana Sherman, MBARI
Lynne Talley, Scripps Institution of Oceanography
Xuchen Wang, UMass Boston
António Baptista, CMOP
Andrew Barnard, Wetlabs
Francisco Chavez MBARI
Carla Curran, Savannah State University
Kendra Daly, University of South Florida
Hajo Eicken, University of Alaska Fairbanks
Gene Feldman, NASA
Kim Frashure, UMass Boston
David Fries, Univ. South Florida
Corey Koch, Wetlabs
Tom Long, Southern Maine Community College
Ken Smith, MBARI
Phyllis Stabeno, NOAA
Sam Walker, NOAA
Ian Walsh, Wetlabs

Engagement of Community College Professors

Sixteen faculty members from 9 community colleges and 2 universities attended a professional workshop offered by the MATE Center at Monterey Peninsula College focused on learning how to build and deploy ocean drifters. Scientists from NOAA’s Northeast Fisheries Science Center and COSEE NOW at Rutgers University provided the foundation for the science and technology associated with drifters. COSEE NOW worked with the MATE Center to set up a Drifter Blog documenting the partners’ triumphs and tribulations with drifters (see <http://coseenow.net/mate/>). With the help of COSEE NOW, the MATE Center also started partner webinars to share information and best practices (<http://coseenow.net/mate/?p=229>). Many college–research collaborations are springing up, such as those between Monterey Peninsula College and the Monterey Bay Aquarium Research Institute (MBARI)/Central Coast Ocean Observing System (CenCOOS) to study harmful algal blooms, and Long Beach Community College and the Aquarium of the Pacific to study the movement of trash in the Southern California Bight. These anecdotal stories demonstrate the potential for community colleges to partner with researchers and government agencies to enhance learning experiences for the students, while contributing to solutions to regional issues.

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In August 2010 the MATE Center held a workshop to teach faculty how to integrate drifter data with other marine remotely sensed data. NOAA's Southwest Fishery Science Center co-hosted the workshop with the MATE Center. In addition to the college faculty, 8 resource managers and scientists attended the workshop. Faculty and scientists created time animations in Google Earth where the drifter data was displayed with other oceanographic time series data (collected remotely and in situ). All of the skills required to build, maintain, and operate drifters (electronics, satellite communications, data management, and more) will greatly enhance a student's preparation for MATE's at-sea internships as well as for the workplace.

Community Colleges: Monterey Peninsula College (CA), College of the Redwoods (CA), Bristol Community College (MA), Cape Fear Community College (NC), Long Beach Community College (CA), Southern Maine Community College (ME), Kingsborough Community College (NY), Clatsop Community College (OR), Brookdale Community College (NJ).

Universities: Humboldt State University (CA), University of Maine at Machias

COSEE Central Coordinating Office

Supporting Scientists to Make Education Presentations

Although the CCO did not assist scientists on specific broader impact statements in proposals, the CCO staff did facilitate presentations featuring scientists for general audiences.

Smithsonian Sant Ocean Hall Lecture Series:

- Dr. Isaac Ginis, University of Rhode Island
- Dr. Jeremy Jackson, Scripps Institution of Oceanography
- Dr. David Hollander, University of Southern Florida

National Science Teachers Association National Conference COSEE Luncheon: 2009, New Orleans

Dr. Isaac Ginis, University of Rhode Island

2010, Philadelphia

Dr. Scott Glenn and Dr. Oscar Schofield, Rutgers University

2011, San Francisco

Dr. David Hollander, University of Southern Florida

Society for the Advancement of Chicano and Native Americans in Science (SACNAS) 2010, Dr. Dwight Coleman, Inner Space Center

CCO staff facilitated a workshop for young investigators:
American Geophysical Union 2009 Fall Meeting (AGU)
Young Investigators Workshop

CCO staff worked with all COSEE centers to collect and organize oil spill resources in response to the 2010 Deepwater Horizon Event

<http://www.cosee.net/resources/themes/oilspills/>

